The economic and environmental performance of grazing and zero-grazing systems for Dutch dairy farms

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For quality of life

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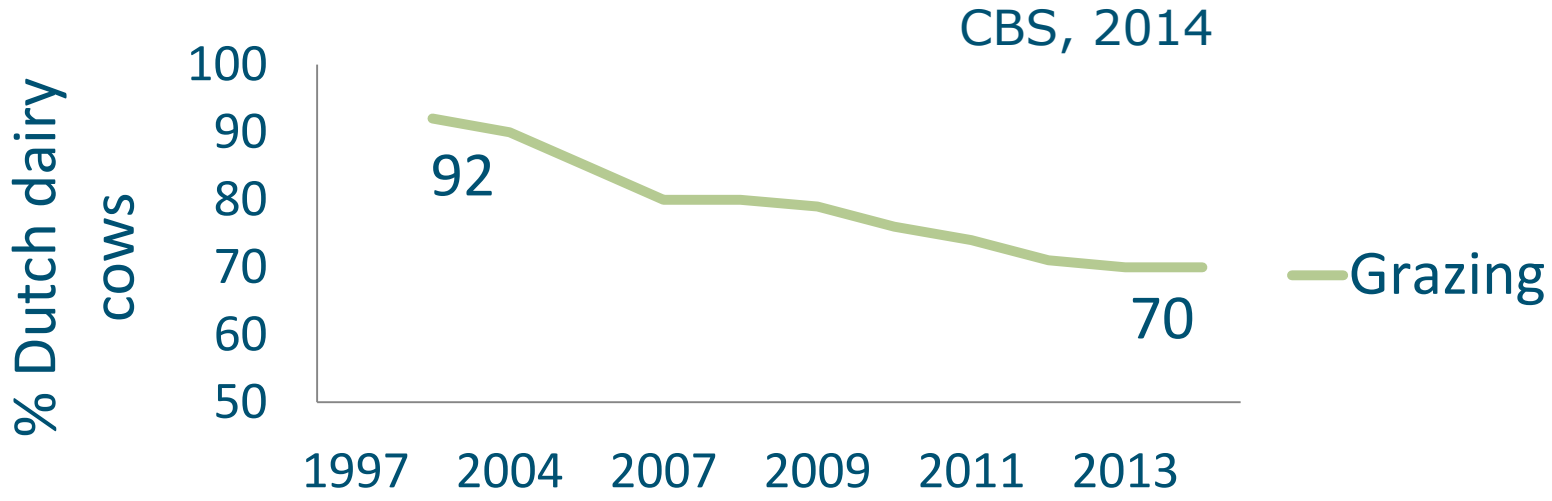
Dairy sector - developments past years

Larger herd sizes

Higher milk yield/cow

More use of automatic milking systems (AMS)



Current situation summer period

day and night grazing
16%
(of Dutch dairy cows)

day grazing
54%

zero-grazing
30%

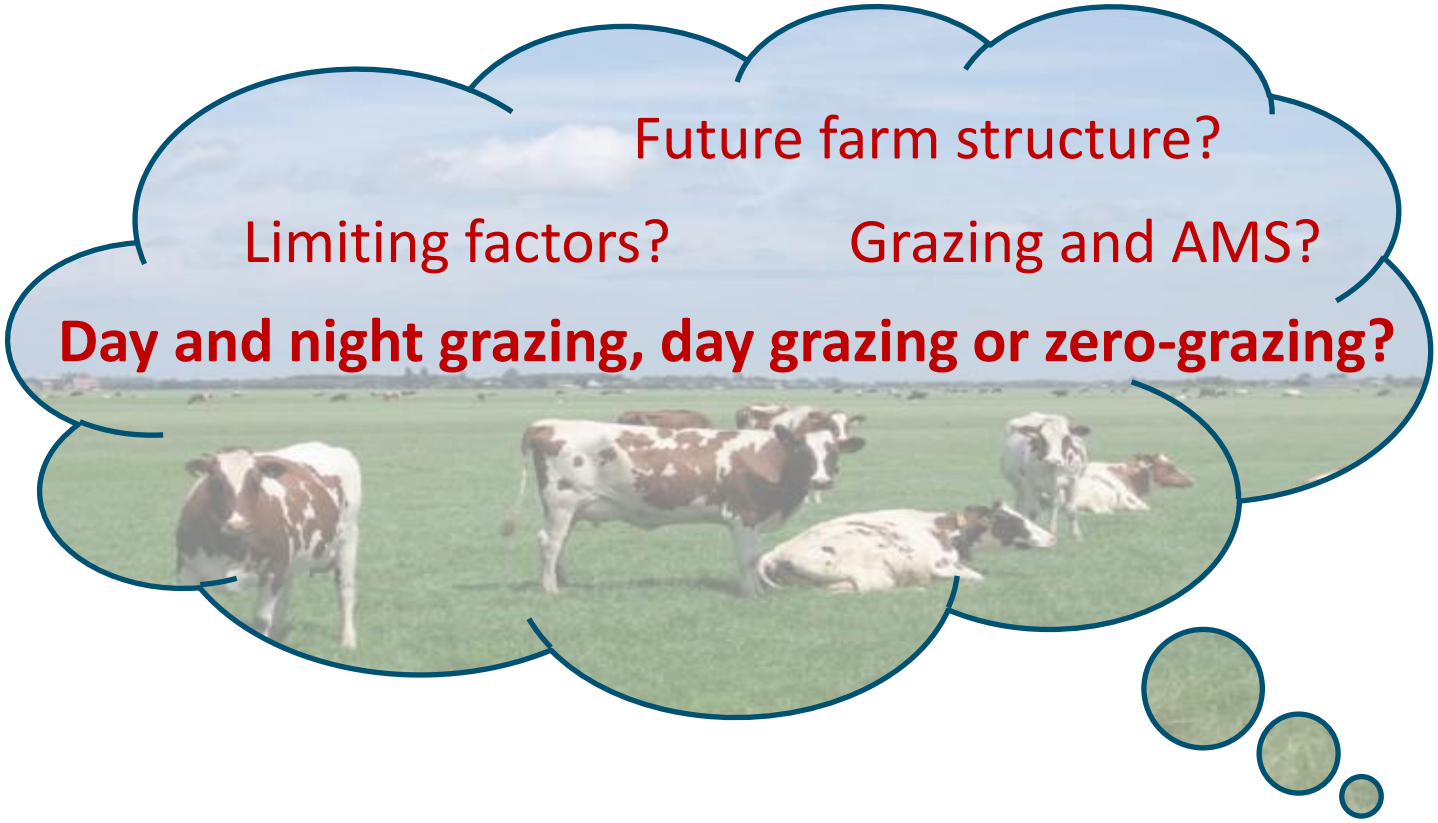
Recent changes in legislation

Milk quota abolishment

Phosphate (P_2O_5) excretion limits

P_2O_5 surplus removal

Objective



To analyse the labour income and greenhouse gas emissions of Dutch dairy farms in a post-quota era

Modelling dairy farms with AMS for 2020

Dairy farm model with relevant activities and constraints

day and night grazing

day grazing

zero-grazing

linear programming – maximise labour income

Labour income in €/year

Greenhouse gas emissions (GHG) in CO_2-eq:

CO_2, CH_4, N_2O

Activities

For example

On-farm feed production

- Fresh grass → only in summer
- Grass silage
- Maize silage

*Grass yield dependent on nitrogen (N) application: 100-500 kg

Feed purchases

- Concentrates → 3 levels of protein
- Maize silage

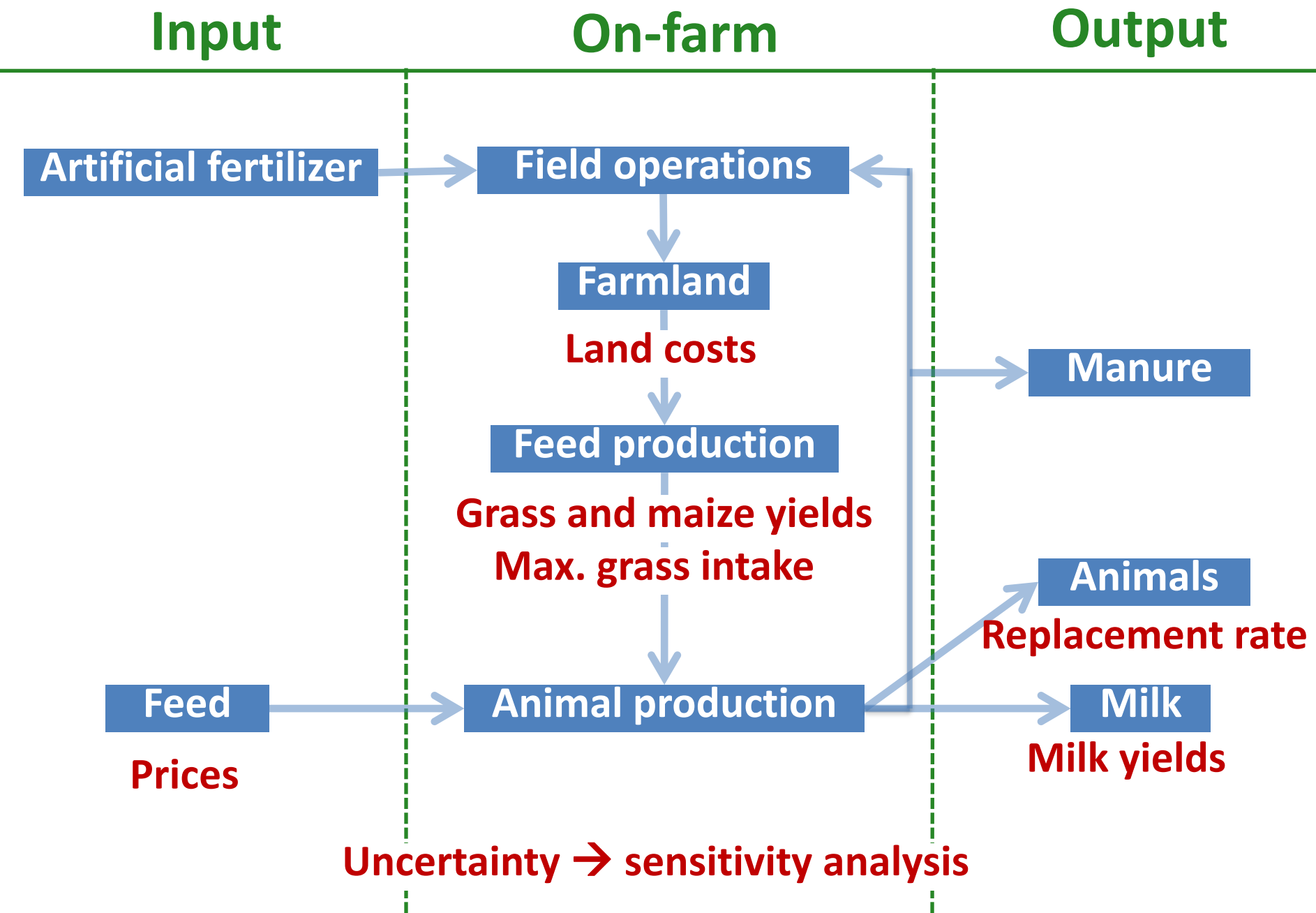
Related constraints

- Dietary requirements
  - Protein
  - Energy → higher when grazing
  - Feed intake capacity

  *Dependent on milk production

- Capacity machinery
- Labour availability
- Nutrient content manure → N and P_2O_5 balance

Model assumptions 2020



Results basic scenario – farm structure

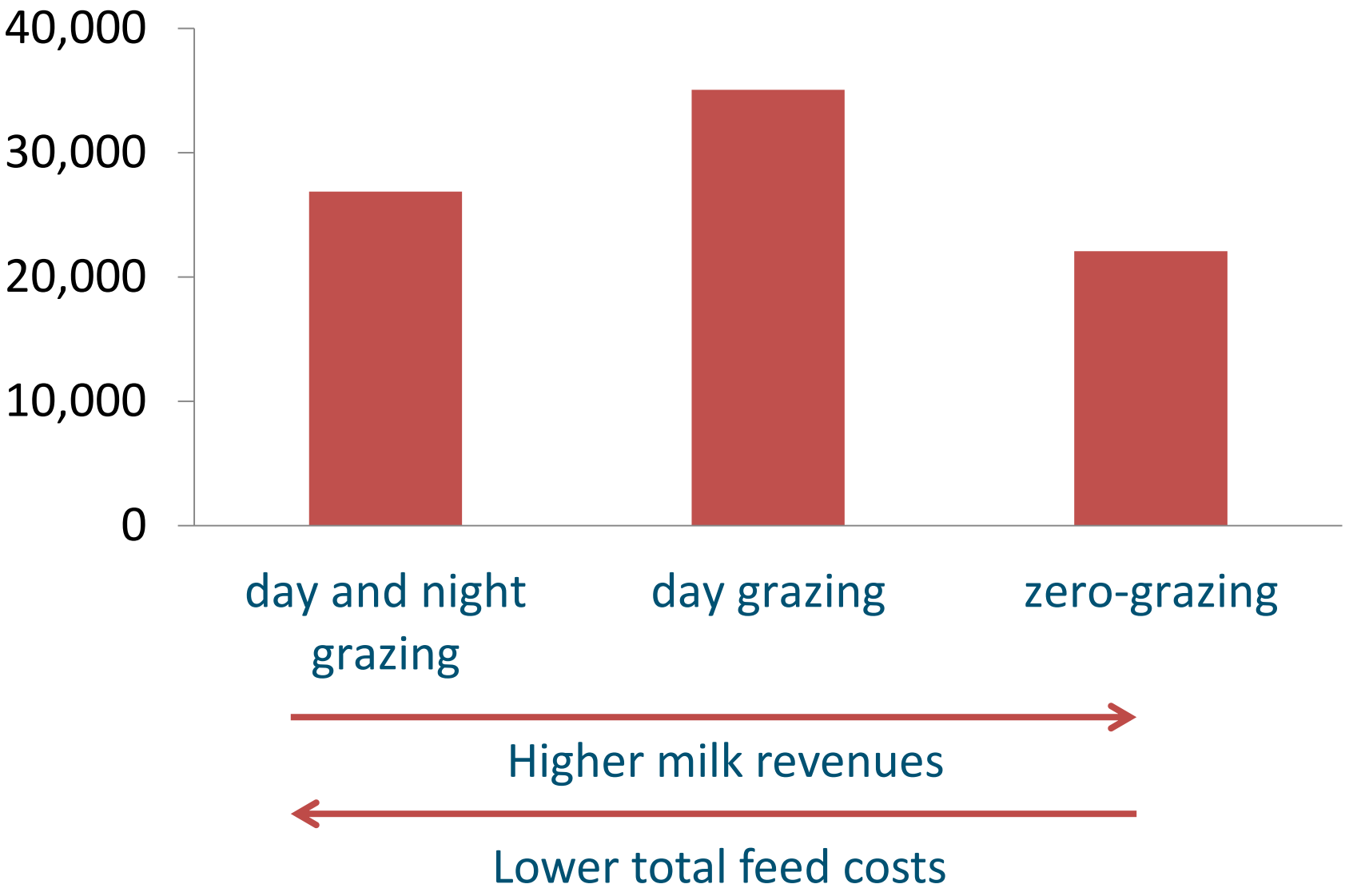
	unit	Day and night grazing	Day grazing	Zero-grazing
Total farmland	ha	64 80% grassland	74	58
Milking cows	n	113	126	123
Farm intensity	kg milk/ha	14,888	15,282	21,208

Diet composition milking cows

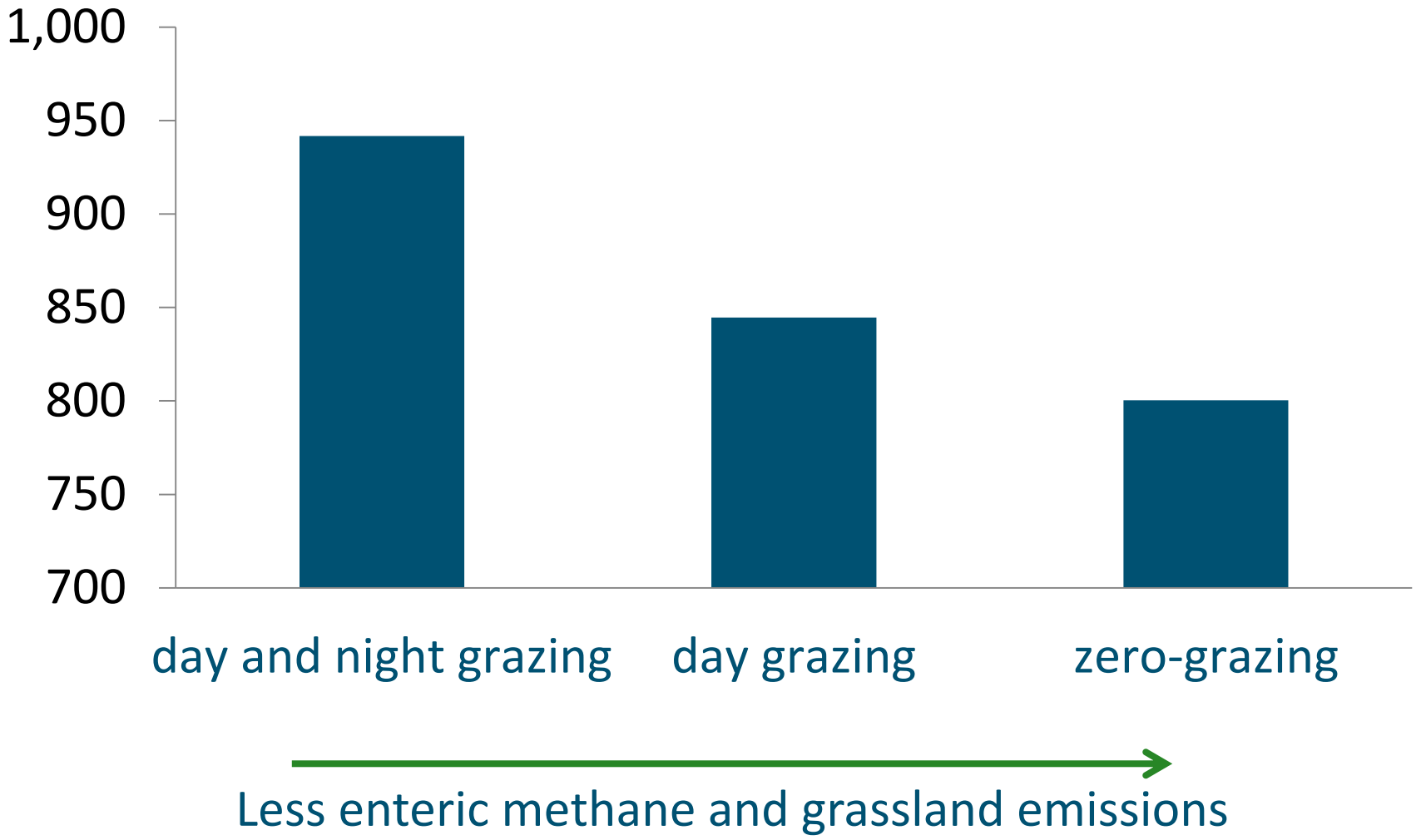
% DM summer	Day and night grazing	Day grazing	Zero-grazing
Grazed grass	75	37	
Grass silage		5	9
Maize silage	21	52	62
Concentrates	4	6	29

% DM winter	Day and night grazing	Day grazing	Zero-grazing
Grass silage	18	23	30
Maize silage	42	49	49
Concentrates	40	28	21

Labour income in €/year



GHG emissions in CO_2-eq/t FPCM



Restrictions in farm size and intensity

Day and night grazing

— Max. allowed P_2O_5 excretion

— No manure export

Day grazing

— No roughage purchases

Zero-grazing

— Max. allowed P_2O_5 excretion

Sensitivity analysis: influencing factors

All systems: Milk price and **land costs**

Day and night grazing

— Milk production per cow

— Grazing losses

Grazing systems: improvement potential

Day grazing

— Milk production per cow

— Max. grass into milk (in combi with AMS!)

Zero-grazing

— Manure removal costs

— Feed prices

Conclusions

All economically feasible in 2020

BUT different vulnerability to different future scenario's

day and night grazing

day grazing

zero-grazing

Economically most attractive

Greenhouse gas emissions in between

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