A tool to efficiently replace dairy heifers using genomic information

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Aim: to develop a dairy heifer management tool

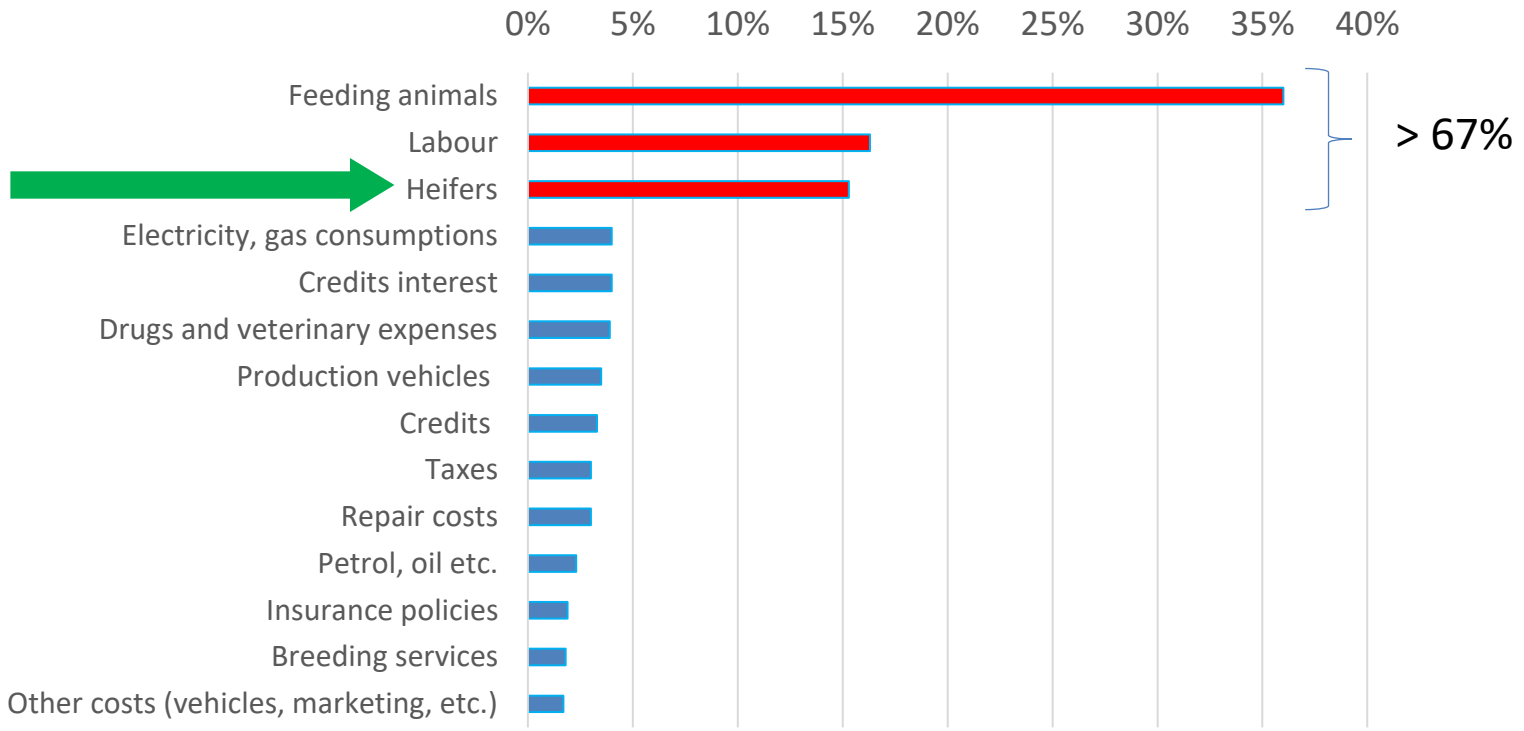
1. optimize the number of heifers to replace cows in the dairy herd;
2. provide farm specific analyses;
3. improve genetic progress;
4. reduce costs.

Introduction

Dairy farmers usually **breed indistinctly all their animals** in order to obtain as many female calves as possible and then raise them as replacement.

Is it really convenient?

What affects herd profitability?

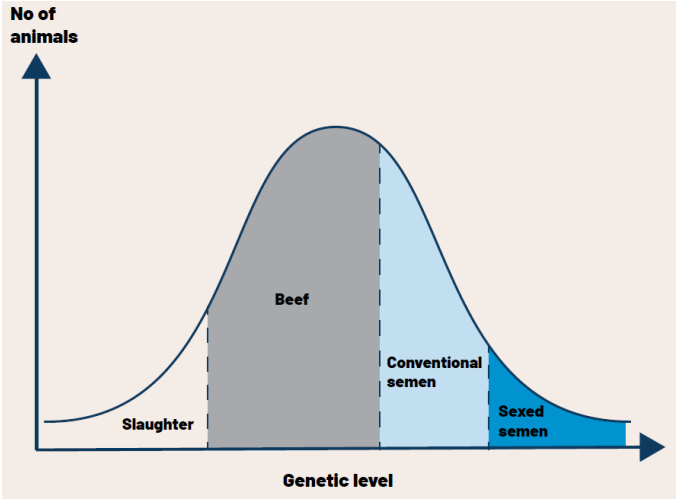


Breed only the animals to keep as replacement

New available technologies in Artificial Insemination (AI)

- Genomic
- Sexed semen
- Crossbreeding with beef semen

Find the best strategy for a herd



Improving genetic merit:

$$\uparrow \Delta G = \frac{\uparrow r_{IH} \times i \times \sigma_A}{\downarrow L}$$

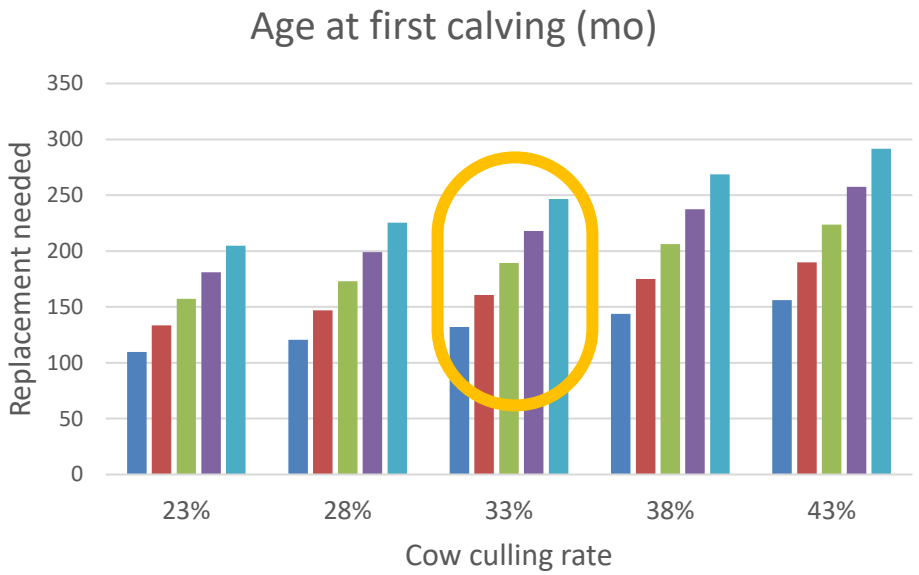
Effects:

- better animals
- evaluation accuracy
- avoid overcrowding conditions
- better animal welfare and sustainability

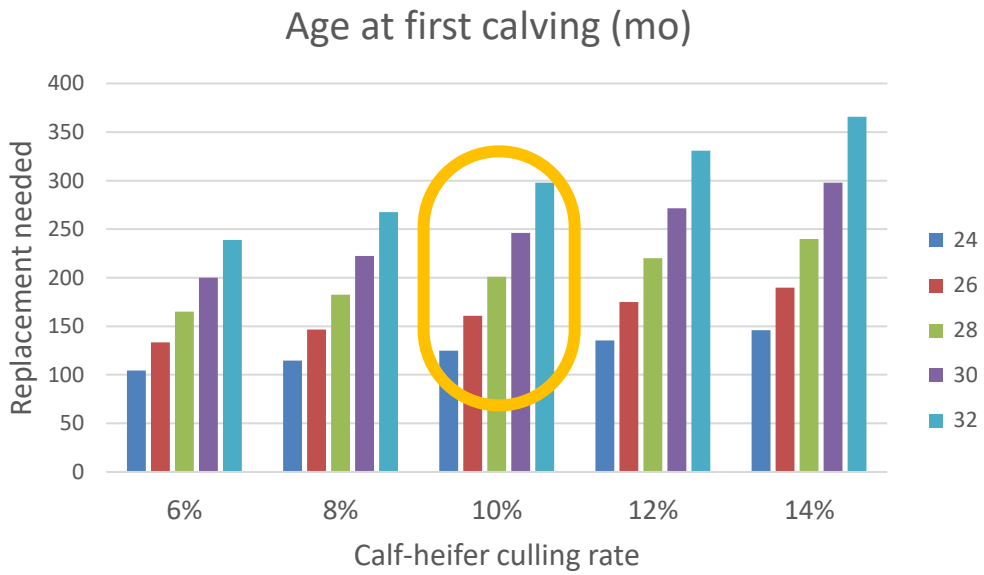
Parameters affecting the number of annually required replacement animals in a herd

- number of adult cows
- calf – heifer culling rate
- adult cow culling rate
- average age at first calving (AFC) → Crucial parameter

How AFC impacts on the number of replacements



Δ= more than 100 heifers



Δ= ~ 175 heifers

Heifer Replacement model (Cabrera V.E., 2009)

Economical and environmental impact of a reduction in the number of heifers needed

2 scenarios

- #1 Herd with 200 Holstein cows with AFC 28 mo
- #2 Herd with 200 Holstein cows with AFC 24 mo

Dairy heifers replacement needs calculation

	#1 Herd	#2 Herd
Adult cows (n°)	200	200
Adult cow culling rate (%/year)	28%	28%
Calf – heifer culling rate (%/year)	8%	8%
Age at first calving (month)	28	24
Heifers needed	160	133

Difference of 27 heifers

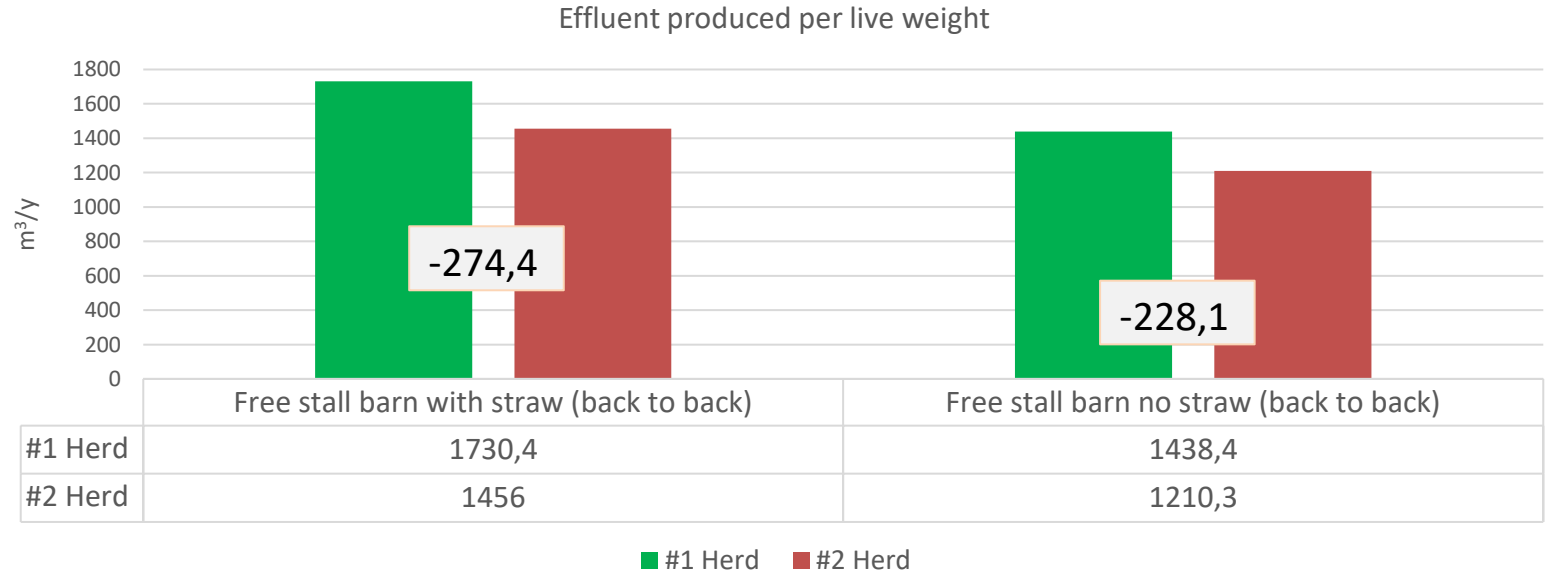
Economic impact

	#1 Herd	#2 Herd
Feed cost (€/d)	2	2
Milk price (€/l)	0.35	0.35
Age at first calving (month)	28	24
Heifers needed (n°/year)	160	133
heifers' maintenance feed costs (€)	273,280	194,712
Gross income from milk (€/head/productive life)	(Δ 120 d * 30 kg/d=3,600 kg milk) 3,600 kg * 0.35 = **1,260 €**	

Environmental impact (1/2)

Based on the Lombardia region nitrates Directive of March 2020 (91/676/CEE – 2020-2023)

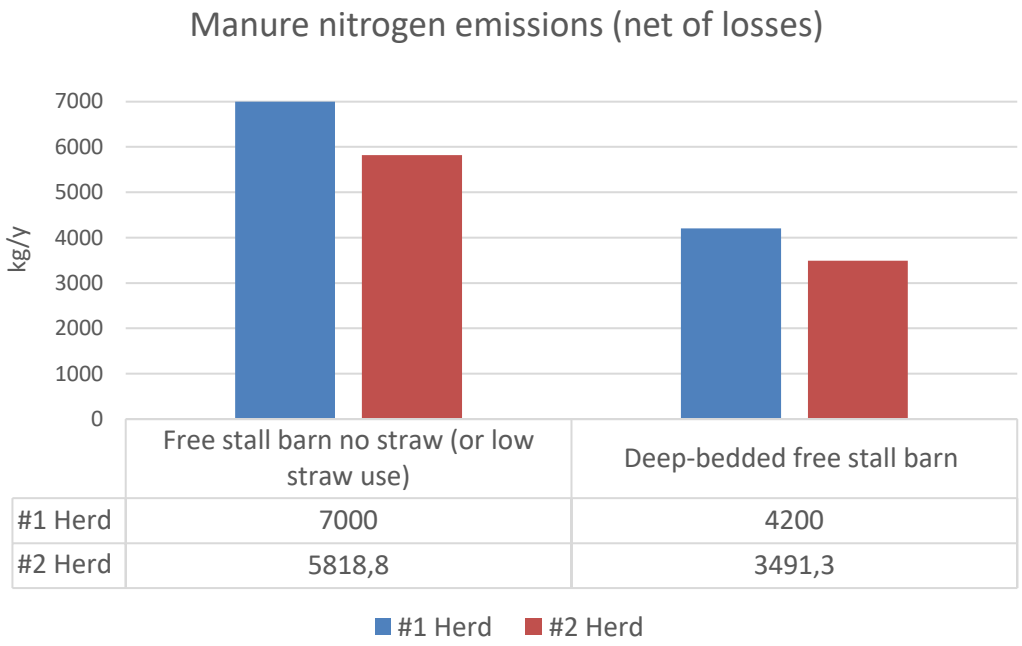
Amount of effluent produced per live weight and per year in relation to the type of housing (dairy heifers 350 kg)



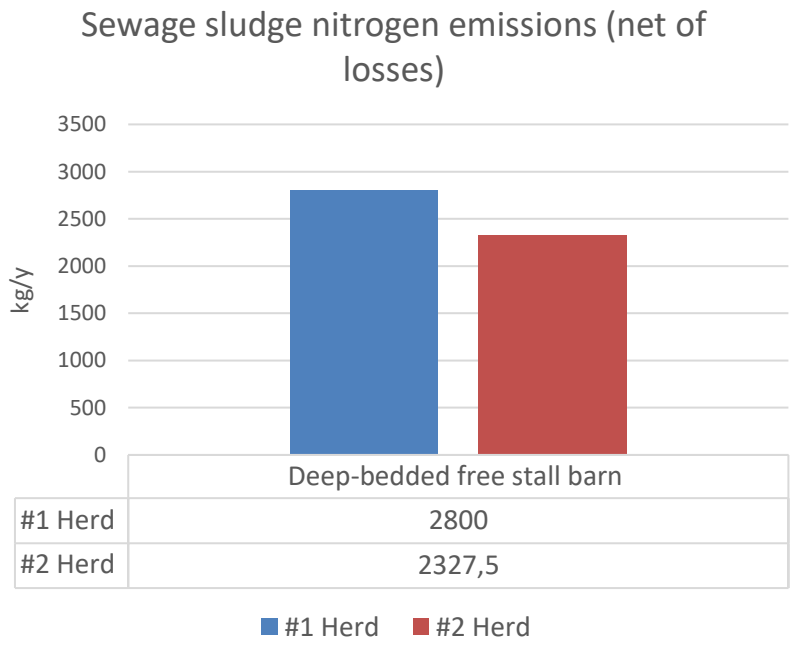
	Free stall barn with straw (back to back)	Free stall barn no straw (back to back)
#1 Herd	1730,4	1438,4
#2 Herd	1456	1210,3

Environmental impact (2/2)

Nitrogen emissions: field values per year net of NH_3 emission losses (dairy heifers 350 kg)



	Free stall barn no straw (or low straw use)	Deep-bedded free stall barn
#1 Herd	7000	4200
#2 Herd	5818,8	3491,3



	Deep-bedded free stall barn
#1 Herd	2800
#2 Herd	2327,5

Conclusion and future perspectives

- Dairy heifers represent both a significant cost for dairy herds and an opportunity.
- Age at first calving is an important aspect when considering the number of required replacements.
- Decreasing age at first calving lead to positive economic effects and environmental impact.

Implement the information in ANAFIBJ mating plan (WAM), considering genomic data also.

Thank you for your attention!!

Any questions?

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