

Comparison of Dairy Farming Systems: A Case Study of Indoor Feeding versus Pasture-based Feeding

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Objectives

- To compare indoor feeding to pasture-based feeding in dairy farming under the same condition and within an equal agricultural area at the same time.
- Which feeding system is more efficient in terms of animal performance and the productivity of agricultural land, farm income and labour income?
- Recommendations for its application

Parts of the Project

- **Fodder crops (Green soiling crop)**
- **Animal production**
- **Economics**
- Milk quality and seasonality
- Ecology
- Animal behaviour
- Social aspects and values
- Communication: knowledge transfer (no research)

Experimental design

Indoor feeding (IF) herd:

- 24 dairy cows
- Breeds: Brown Swiss, Holstein-Friesian (1:1)
- Milk performance goal: 8,500 kg lactation⁻¹
- Part-mixed ration with maize/grass silage and protein concentrate
- Concentrate according to the requirements via a concentrate dispenser
- Average body weight of cows: 700 kg

Pasture-based feeding (PF) herd:

- 28 dairy cows
- Breeds: Brown Swiss, Swiss Fleckvieh (1:1)
- Milk performance goal: 6,300 kg lactation⁻¹
- Concentrate at the beginning of the lactation: 280 kg cow⁻¹ lactation⁻¹
- Winter: hay offered ad libitum
- Semi-continuous pasture
- Average Body weight of cows: 600 kg
- Spring calving from February to April

Follow-up over 3 years (2008-2010): a full lactation study

Agricultural Area

2008 – 2010	IF-herd	PF-herd	Yield
	ha		DM dt ha ⁻¹
Area for	mean	mean	mean
Agricultural (producing) area	15.80	15.70	
Pasture (enclosed) / hay	0.93	13.69	142
Grass silage	6.77		138
Maize silage ¹	2.89		177
Ecological compensating area	0.91	0.91	60
Fodder wheat and maize meal ^{1,2}	1.40	0.91	70.4/84.2
Soya bean meal extract (or cake) ³	1.71	0.11	31.5 (67%)
Maize gluten feed (corn) ³	1.20	0.05	63.7 (6.4%)

¹ only in 2008, mostly bought outside of the farm,; ² dry matter: air-dried matter x 0.89 ; ³ allocation to soya bean meal and maize

Materials & Methods

- Mixed farm at Hohenrain, Switzerland, at 620 m a.s.l.
- Exposition southwest, light in humos
- Yearly mean temperature: 9.4 (± 0.5) °C
- Annual precipitation: 1,171 (± 131) mm
- Chemical analysis by NIRS-method at Dairy One Laboratory, N.Y., USA
- Statistical analysis using R (R Development Core Team):
Two-way ANOVA model
 - Feed system (FS) and year (Y), interaction FS x Y performed only for Brown Swiss dairy cows
 - Results in mean and SD: n.s.= not significant: $p > 0.05$, * $p < 0.05$, ** $p < 0.01$

Summary

- The IF system dairy cows fed by PMR, according to individual requirements by 1,100 kg concentrate per lactation, yielded around 9,000 kg ECM.
- Milk solids, feed conversion and feed efficiency were higher in the IF cows than the PF cows.
- The PF system dairy cows, additionally fed by 300 kg concentrate per lactation, yielded around 6,000 kg ECM.
- Species-appropriate animal husbandry in a PF system with a lower production intensity resulted in a higher fertility.

Summary and Conclusion

- Under the Swiss agricultural framework and in respect to the investigated herd and farm size, the higher milk yield of the indoor feeding system cannot compensate for the higher direct and overhead costs.
- Under the given conditions, the pasture based-feeding system resulted in a higher agriculture income and labour income with similar labour productivity in comparison to the IF system.
- Within the conditions given in Switzerland and their related costs, it seems to be economically more interesting to reduce production costs than to increase milk yield of cows.
- However, efficiency is not the only selection criterion when choosing a production system.

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Thanks for your attention!

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