A comparison between housing systems of dairy cows with regard to milk quality, animal welfare and animal health

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Introduction

- The quality of animal products depends on farming systems:
  - housing system
  - grazing or not grazing
  - animal health
  - quality of feed and water
  - etc.
- Housing and grazing are important welfare factors for dairy cows

Grazing/housing – animal welfare

Because of public demand:

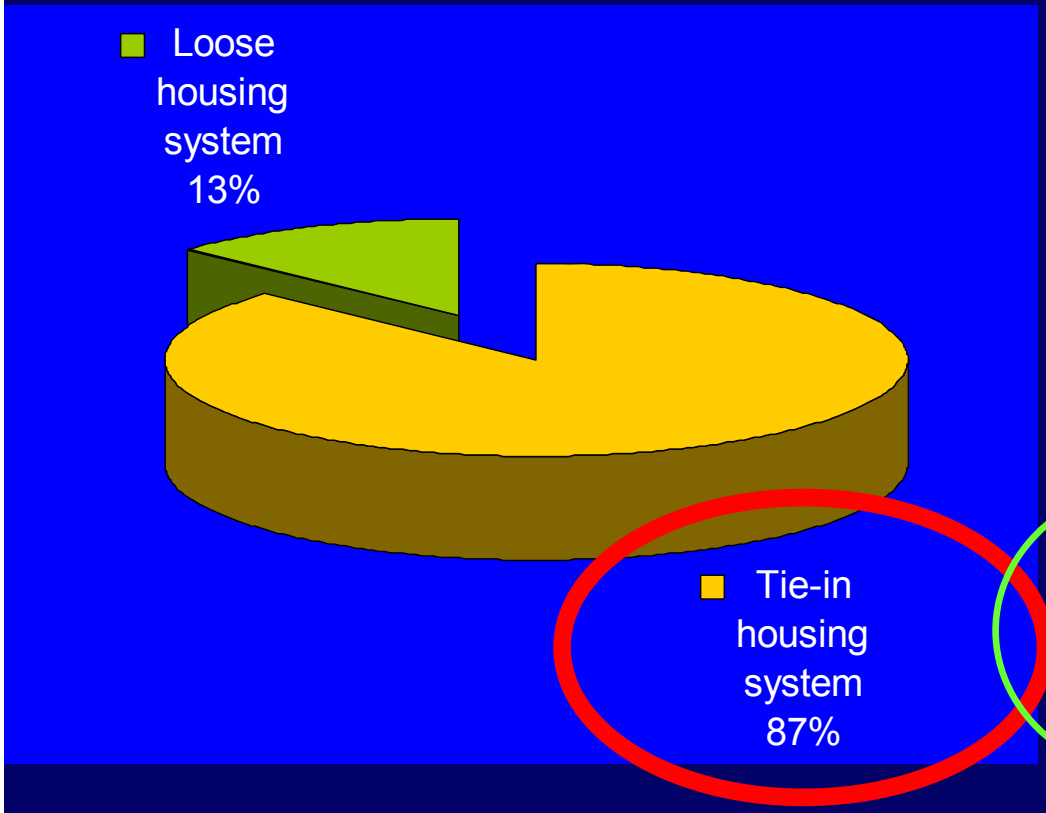
- grazing is stimulated in some countries
- grazing is obligatory for organic farming
- movement of animals is recommended by *cross compliance* conditions (EU Reg. 1782/2003 – exct. measure)
- farmers in Slovenia are afraid for a ban on tie stalls

Objective

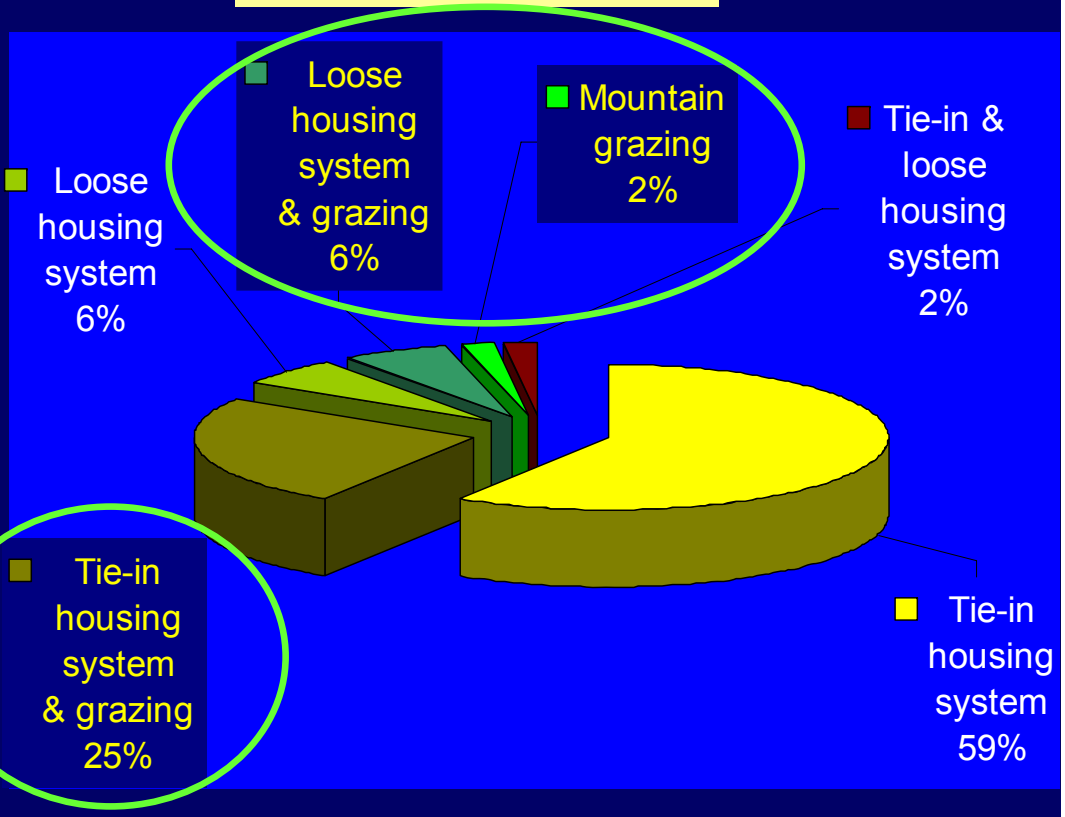
- To compare different housing systems
- To compare grazing or not grazing
- Measure of performance: milk yield and quality, udder health

Present situation – housing system

In winter



In summer

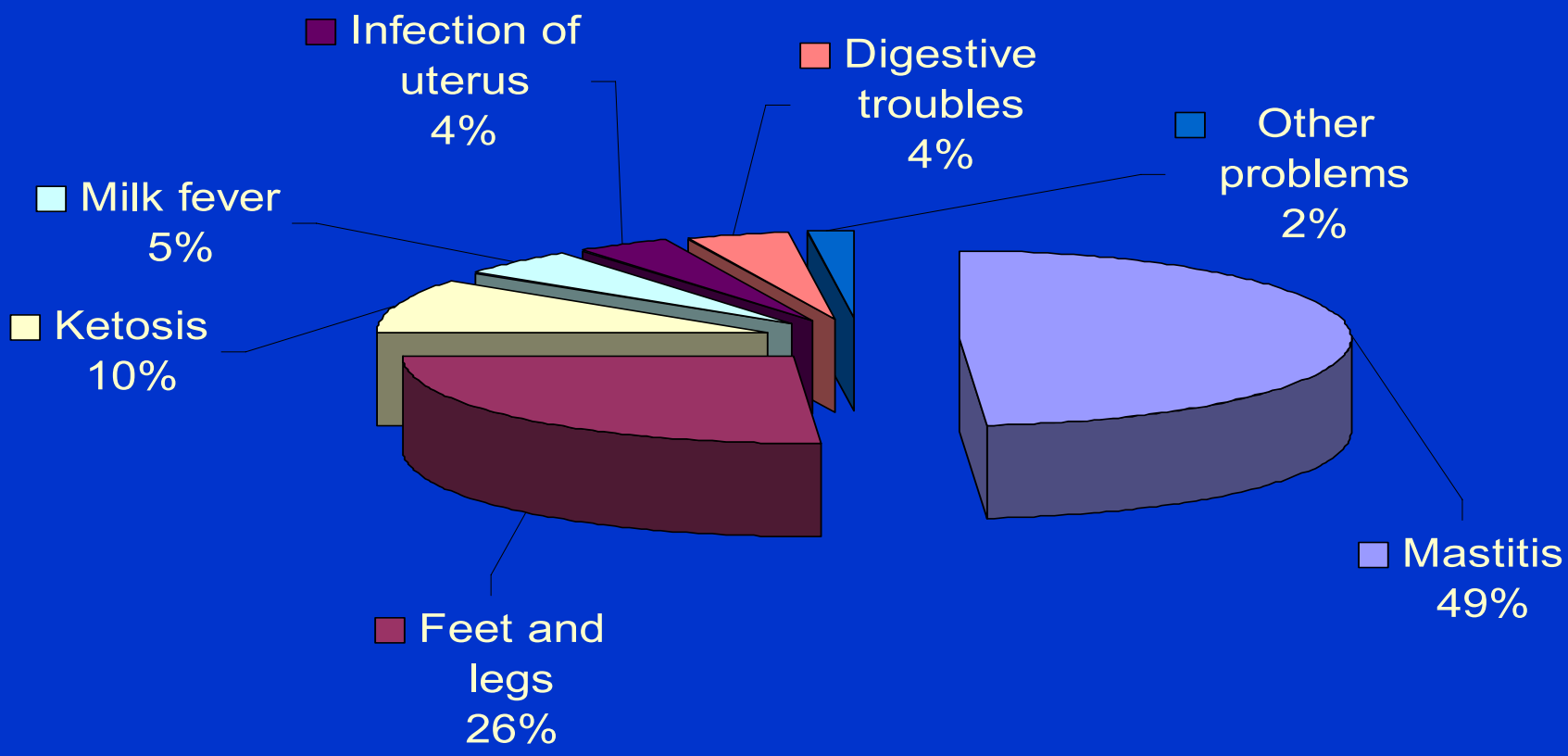


Survey: Data from 5.038 farms with 75.268 dairy cows in Slovenia; 15 cows/farm

Source: MAFF & AIS, Slovenia

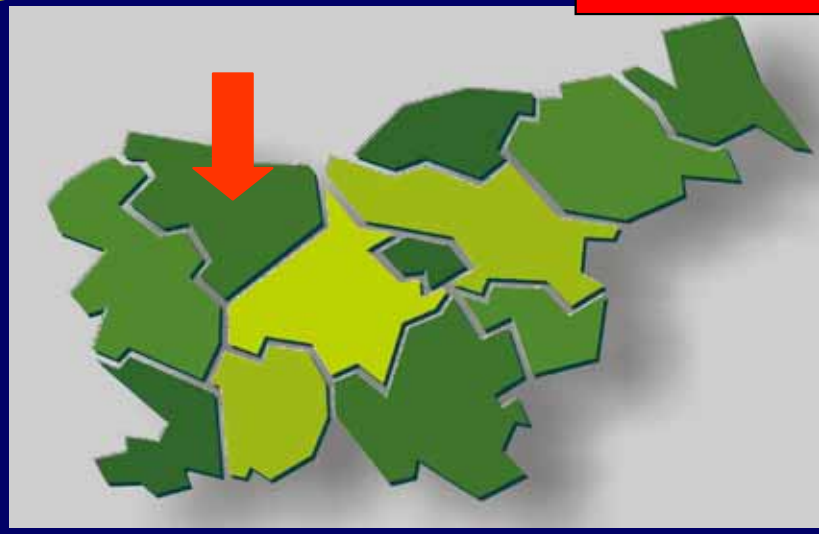
Present situation – animal health

Health problems



Source: MAFF & AIS, Slovenia

Material and methods



Data

- Dairy farms in Gorenjska
- Milk recording data (2000 – 2007)
  - 580.299 measurement / 27.000 cows
  - Milk yield, fat & protein content, SCC, urea
- Housing system for 410 farms, questionnaire:
  - 268 farms with tie housing system (in-door system)
  - 55 farms with loose (cubicle) housing system (in-door system)
  - 58 farms with tie housing system + **grazing** (out-door system)
  - 29 farms with loose housing system + **grazing** (out-door system)
- Breeds and crosses:
  - Simmental, Holstein-Friesian,
  - Simmental x HF cross

Material and methods

Methods

- SAS GLM & Mixed procedure

$$Y_{ijklmno} = \mu + B_i + P_j + L_{jk} + K_l + PK_{jl} + H_m + P_n + S_o + PS_{no} + HS_{mo} + HP_{mn} + F_{mnp} + YS + e_{ijklmnpo}$$

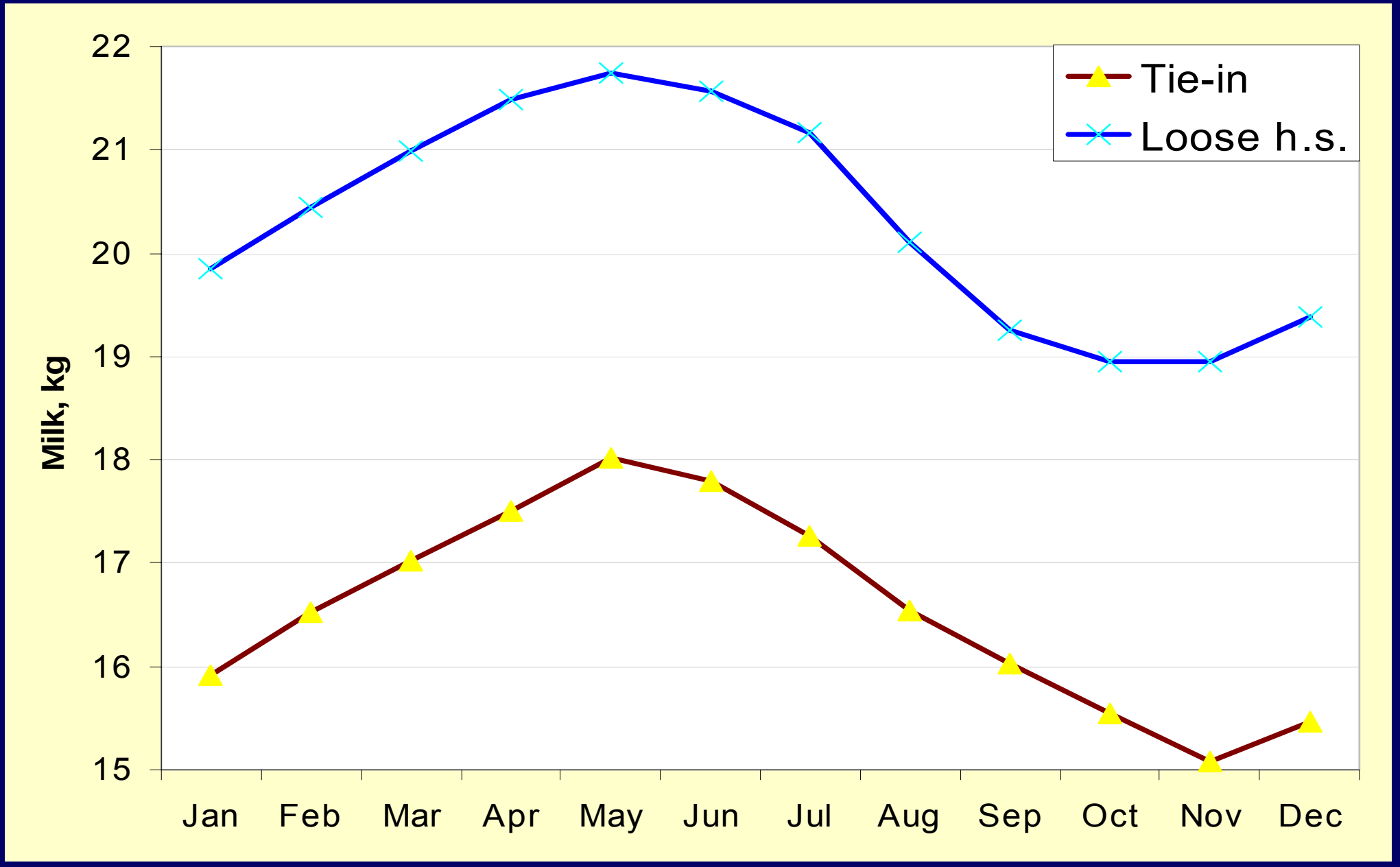
B_i = breed (Simmental, Holstein-Friesian, Crosses)
P_j = Parity group (1= first lactation cows, 2 = other lactation cows)
L_{jk} = Lactation (1, 2, 3, 4, 5 and more)
K_l = Stage of lactation (milk recording: 1, 2 … 12)
H_m = Housing system (1= tied, 2 = loose)
P_n = Grazing or not grazing (0 = no grazing, 1 = grazing)
S_o = Season of milk recording (Months: Jan, Feb….)
F_p = Farm (random)
YS = Year by season (random)
e = residual

Breed effects for milk traits

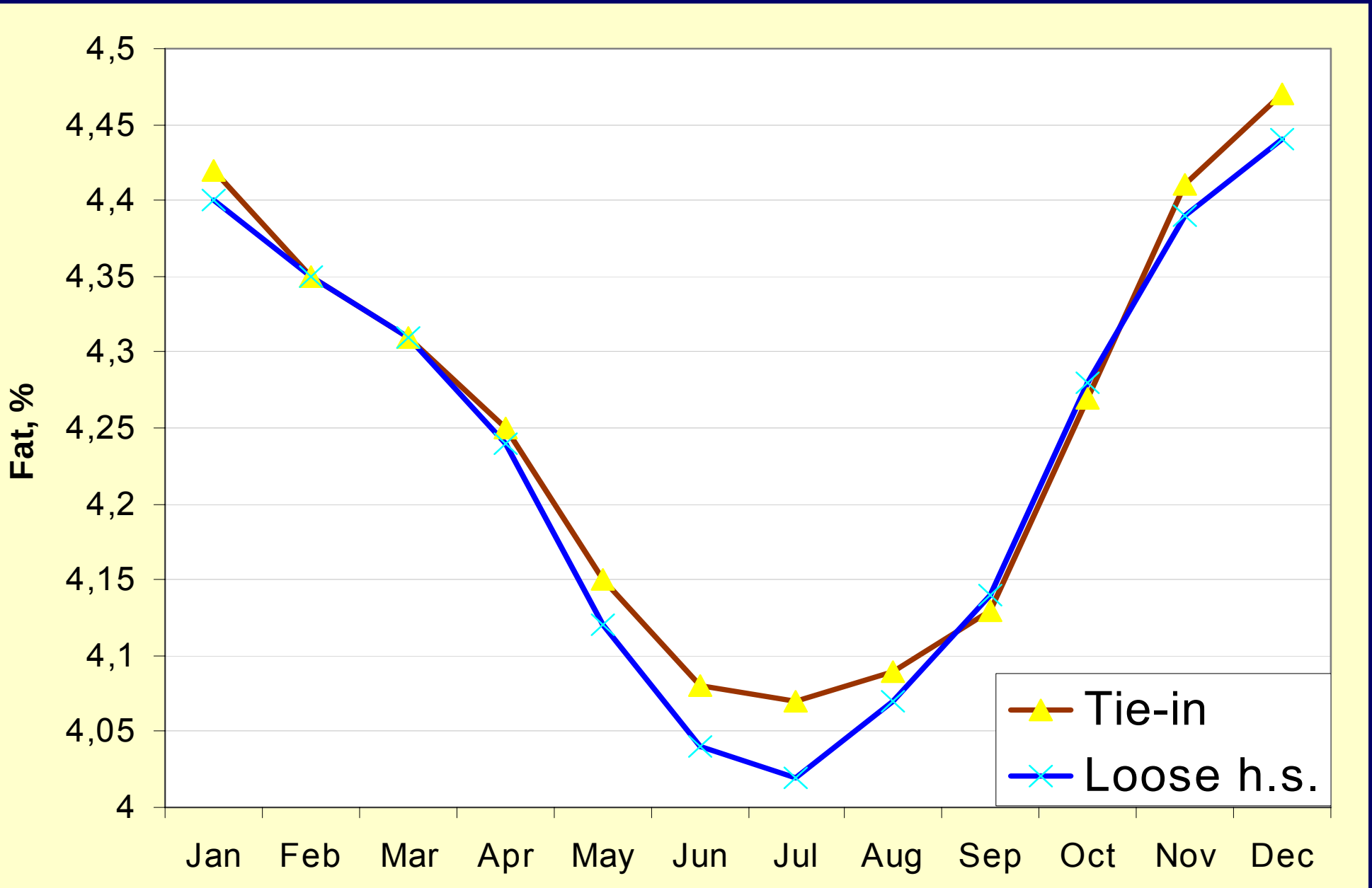
Traits	N	Milk, kg	Fat, %	Prot. %	log SCC	Urea, mg/dl
Simmental	153,442	16.39	4.25	3.52	4.41	23.51
Holstein	323,369	20.78	4.17	3.30	4.87	22.65
Crossing	99,548	18.65	4.18	3.33	4.61	23.55

Effect of housing system

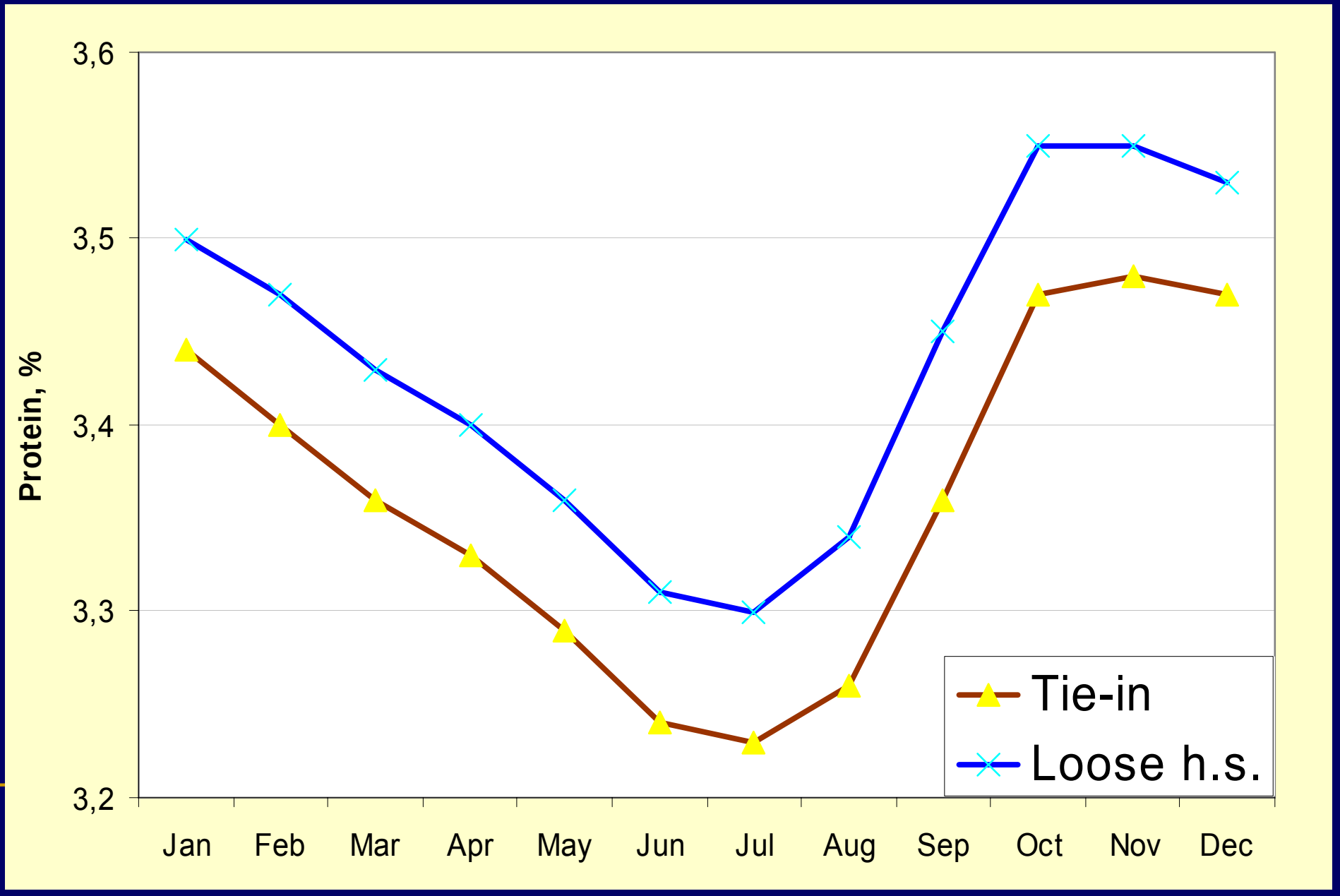
Milk yield (kg)



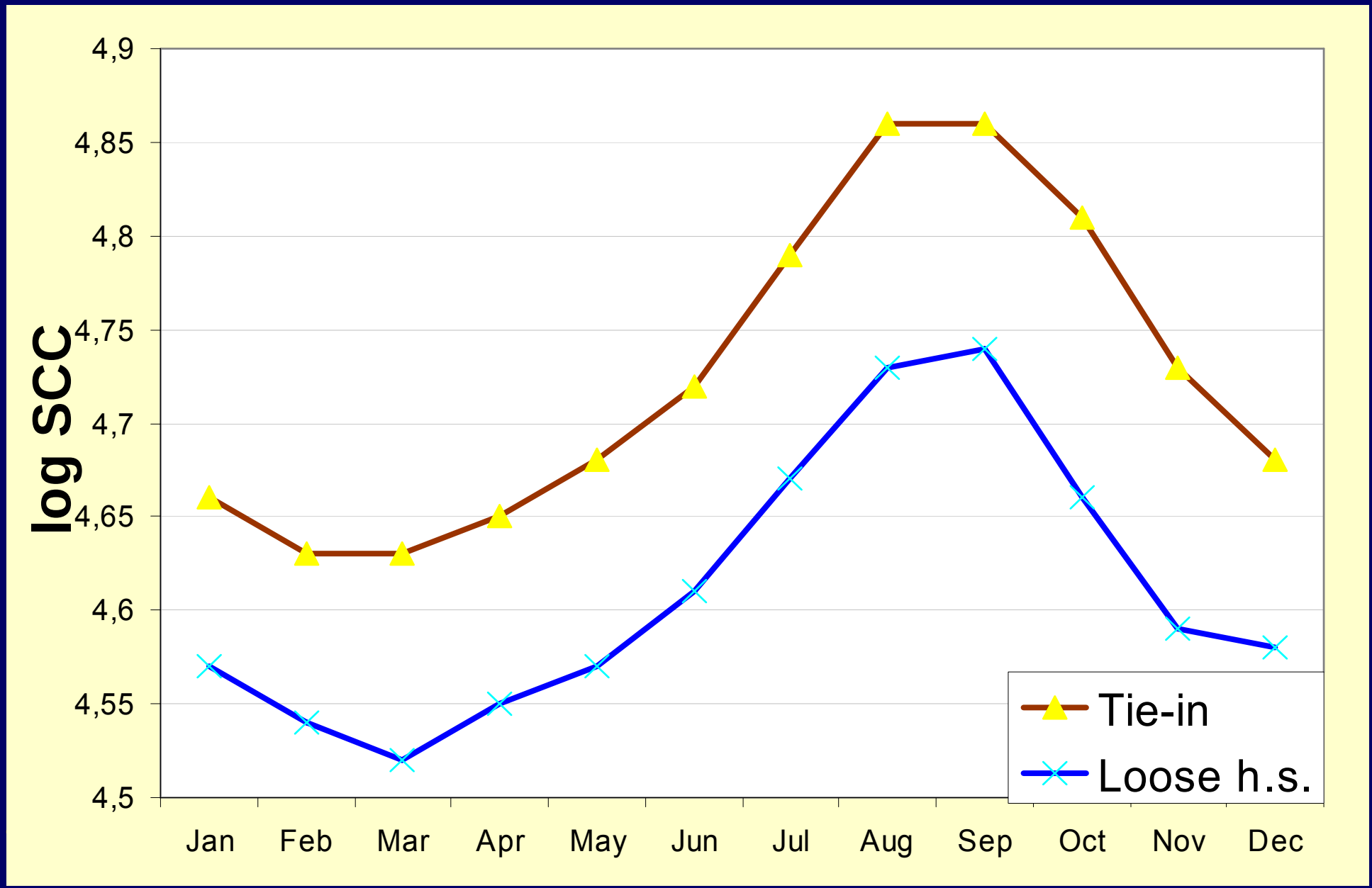
Fat content (%)


4,5
4,45
4,4
4,35
4,3
4,25
4,2
4,15
4,1
4,05
4
Fat, %
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Tie-in
Loose h.s.

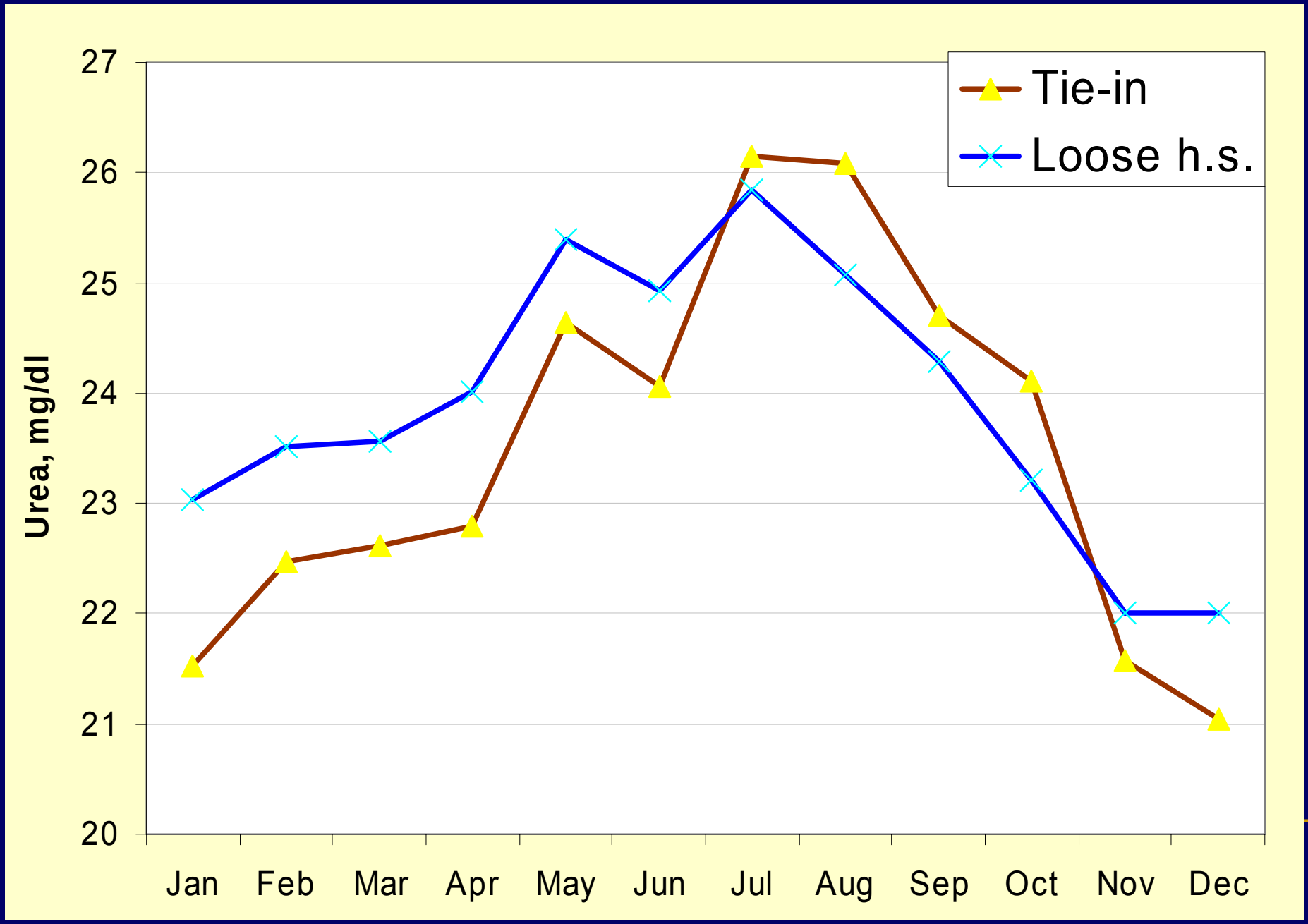
Protein content (%)



log SCC

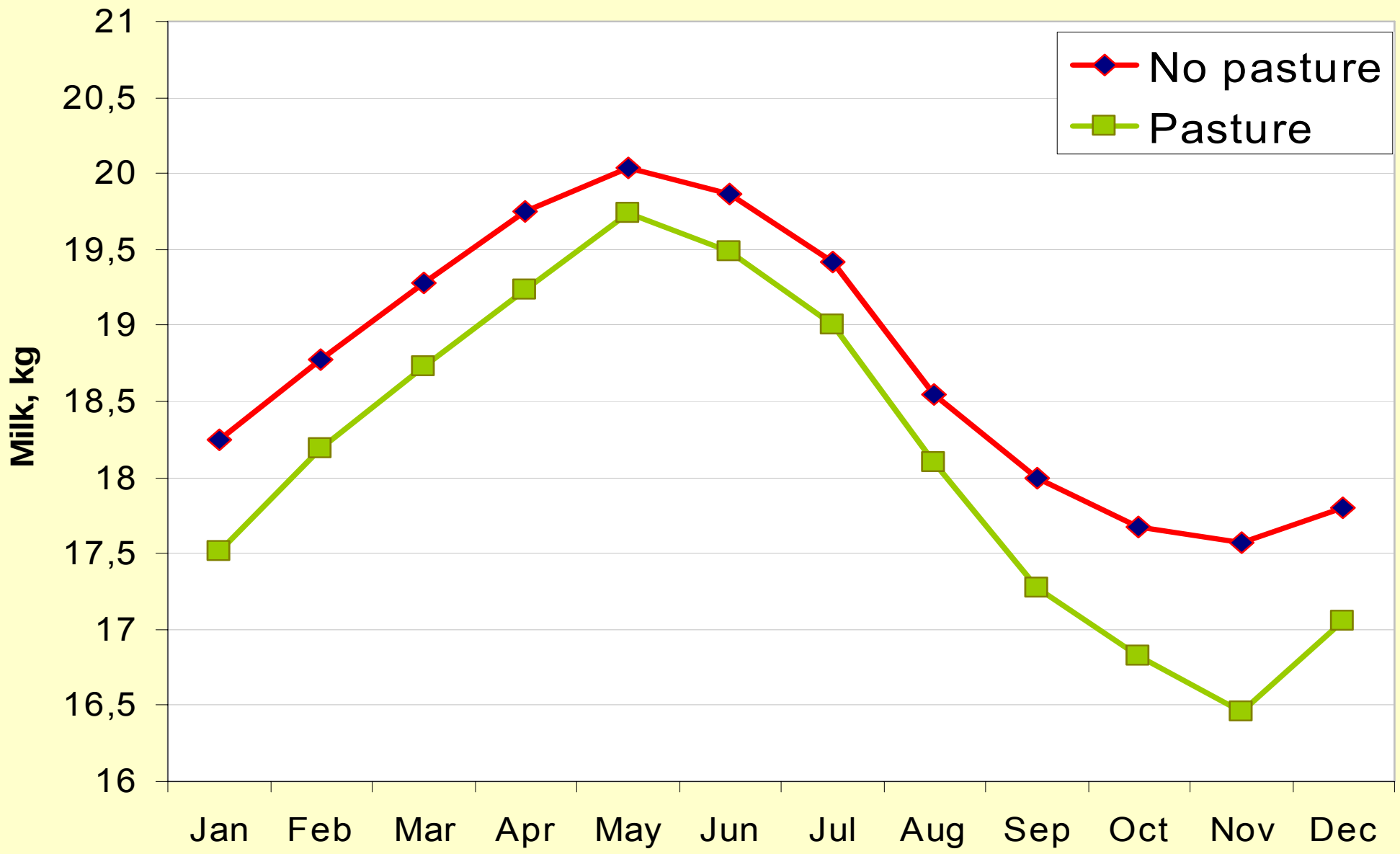

log SCC
4,9
4,85
4,8
4,75
4,7
4,65
4,6
4,55
4,5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Tie-in
Loose h.s.

Urea content (mg/dl)

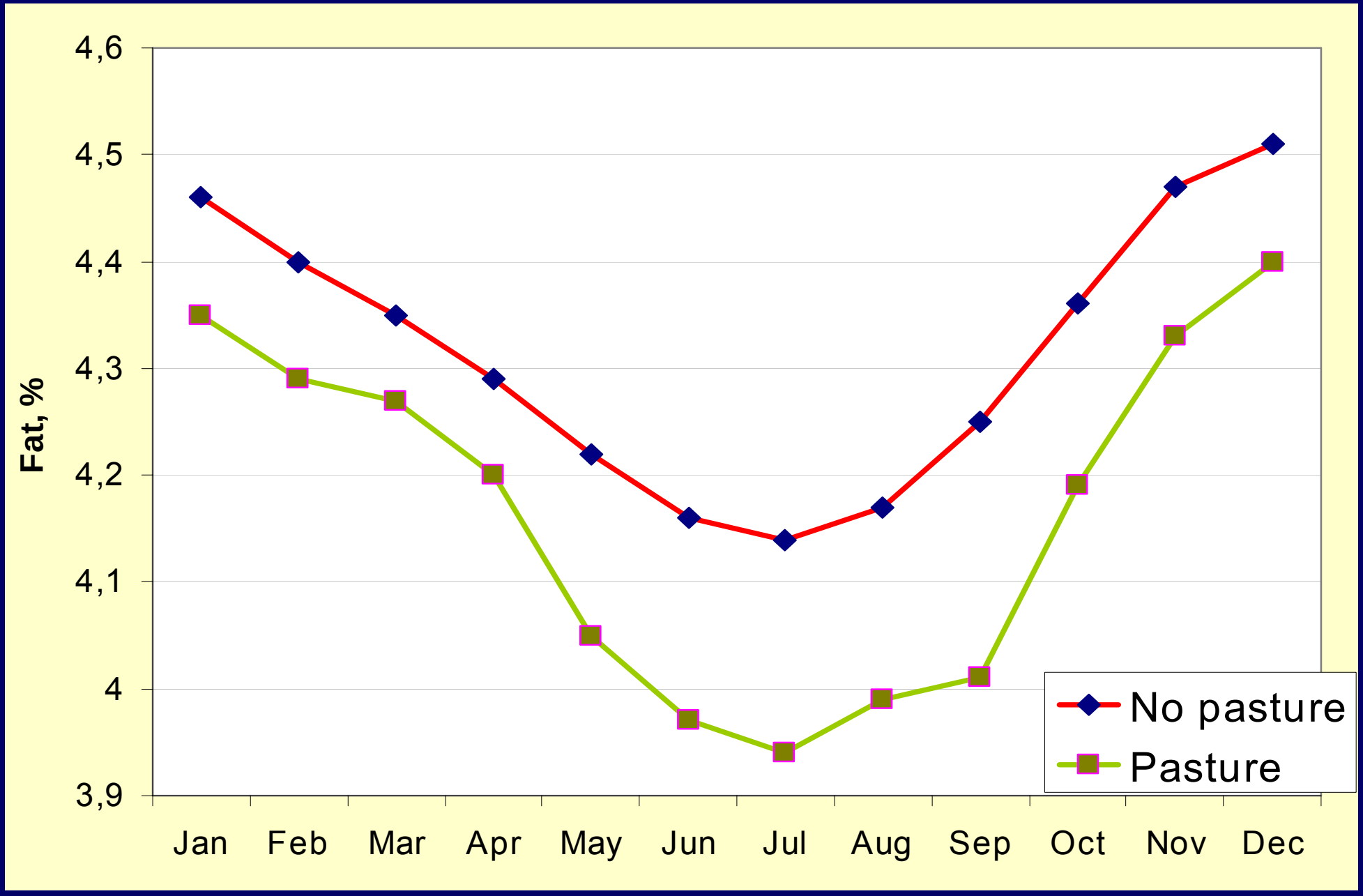


Effect of grazing

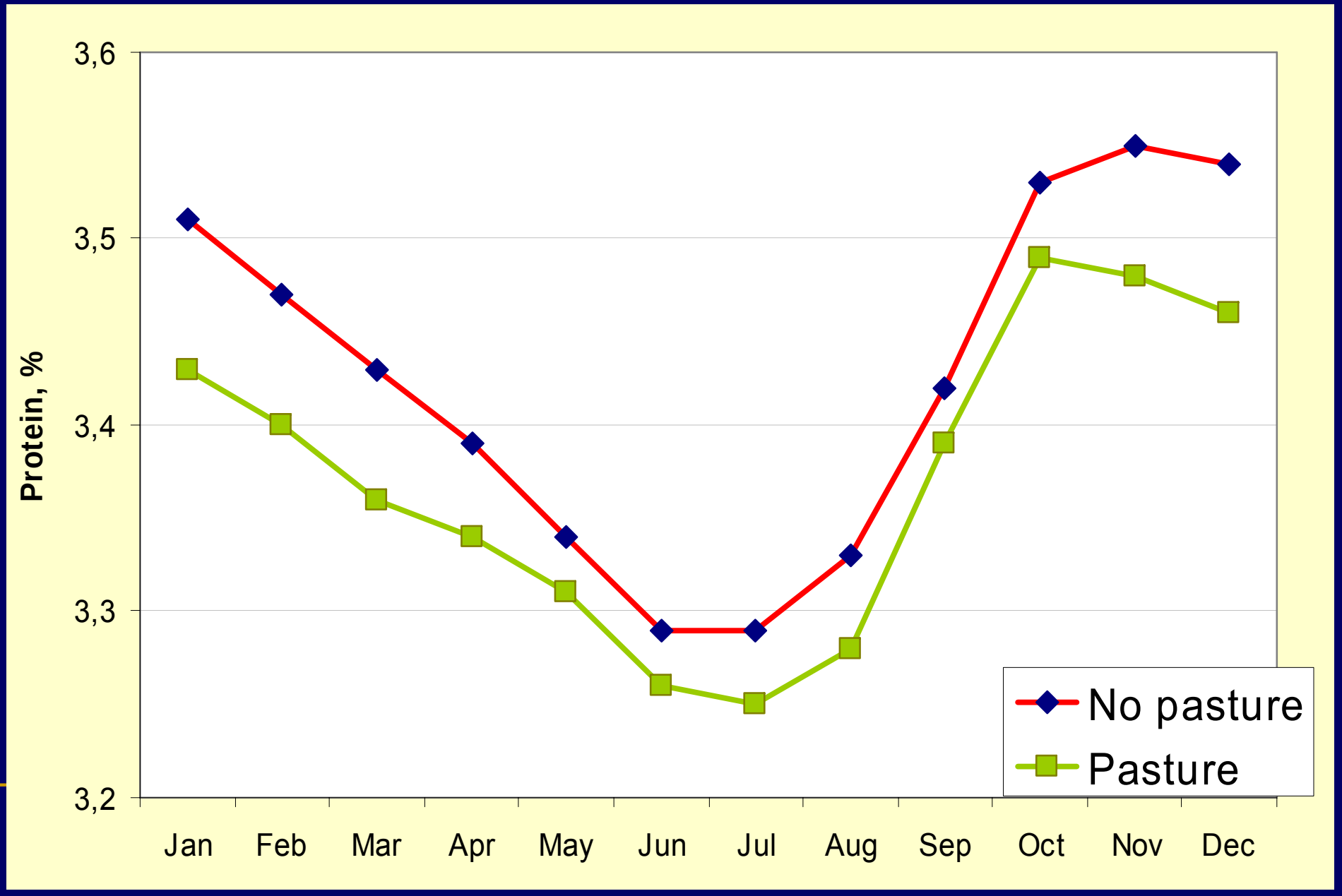
Milk yield (kg)



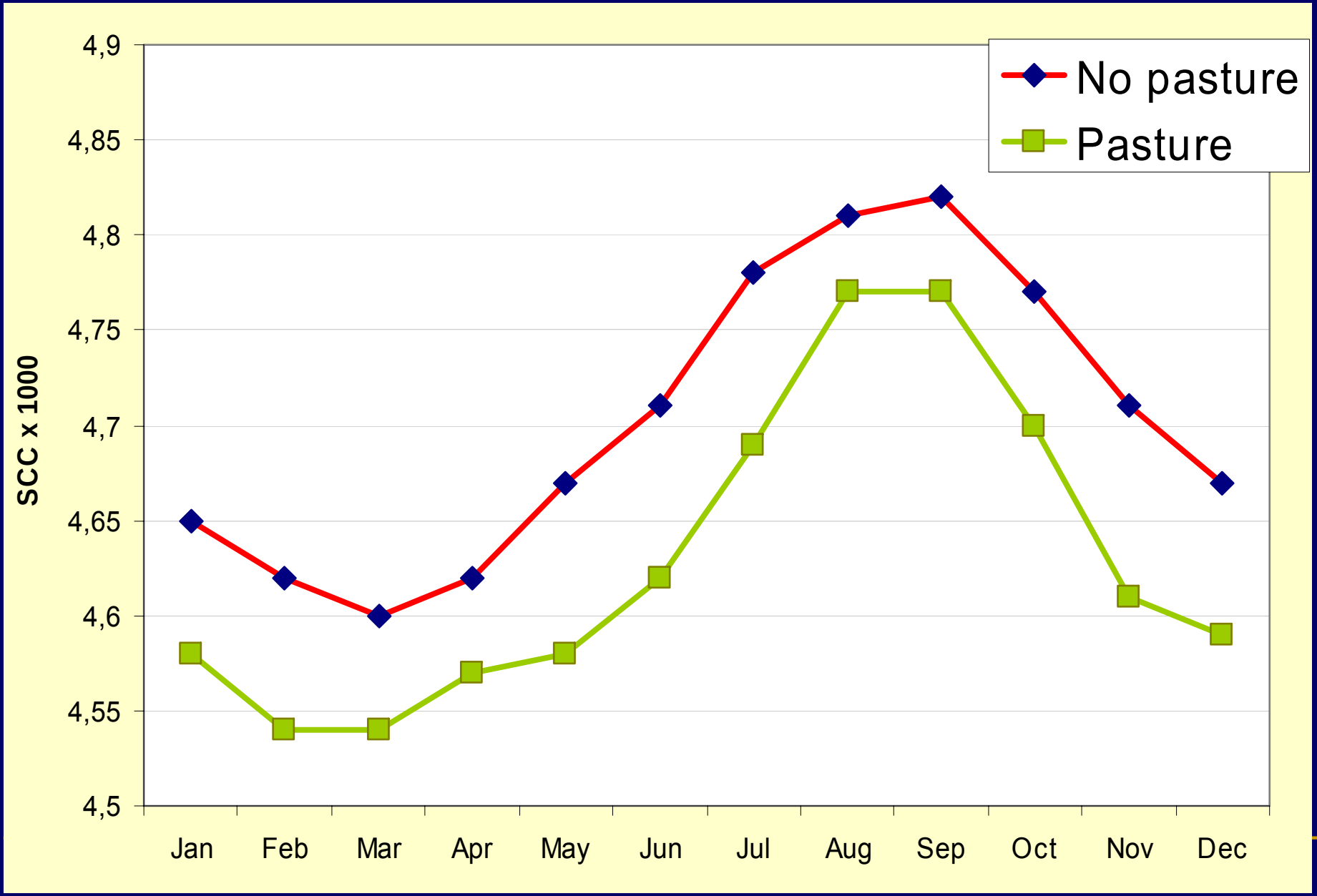
Fat content (%)


4,6
4,5
4,4
4,3
4,2
4,1
4
3,9
Fat, %
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
No pasture
Pasture

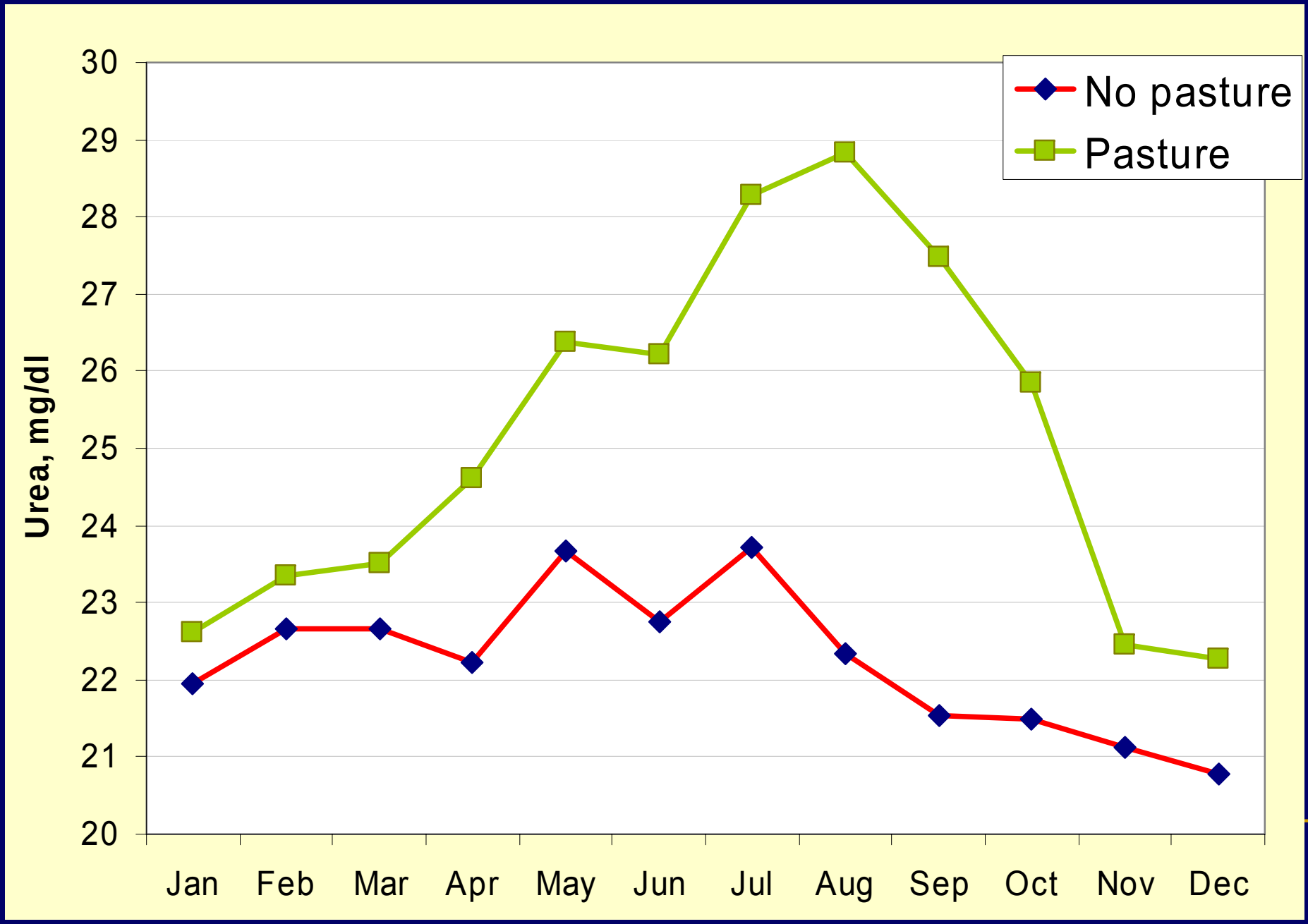
Protein content (%)



log SCC


4,9
4,85
4,8
4,75
4,7
4,65
4,6
4,55
4,5
SCC x 1000
No pasture
Pasture
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Urea content (mg/dl)



Results – Probabilities for Ho

Trait	DF	Milk, kg	Fat, %	Prot., %	logSCC	Urea (mg/dl)
Breed	5	<.0001	<.0001	<.0001	<.0001	<.0001
Parity group	1	<.0001	0,3726	<.0001	<.0001	<.0001
Lact (parity group)	3	<.0001	<.0001	<.0001	<.0001	<.0001
Stage of lact.	10	<.0001	<.0001	<.0001	<.0001	<.0001
Parity x Stage	10	<.0001	<.0001	<.0001	<.0001	<.0001
Housing system	1	<.0001	0,4058	<.0001	0,0073	0,4624
Pasture	1	0.0953	<.0001	0,0007	0,0806	<.0001
Season	11	<.0001	<.0001	<.0001	<.0001	<.0001
Pasture x Season	11	<.0001	<.0001	<.0001	0,0535	<.0001
Housing s. x Season	11	<.0001	<.0001	<.0001	0,0507	<.0001
Housing s. x Pasture	1	0.1714	0,5384	0,0532	0,8576	0,0496

Conclusions

- Sample: Gorenjska region
  - ≈ 80% tie barns
  - 20 % of farms grazing
- Farms with loose housing system reach higher milk production
- Housing system and grazing have statistically significant influence on:
  - milk yield,
  - milk content (fat, protein, urea)
  - udder health (SCC)
- No significant interaction between housing and grazing system

Take home message

- Loose housing system and grazing reach higher milk production
- Improvement of udder health is possible with grazing

Perspective

- Farmers with tie system may have a future, if they will bring cows on pasture

Further analysis

- This study is based on only a few animal welfare and health traits
- We will extend this study with longevity and fertility traits
- This will result in more clear picture with regard to quality and animal welfare effects.

Acknowledgement

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