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Fakultät für Naturwissenschaften und Technik
Facoltà di Scienze e Tecnologie
Faculty of Science and Technology

Performance, behaviour and health of dual-purpose chicken under mountain farming conditions

Christian Lambertz, K. Wuthijaree and M. Gauly
Faculty of Science and Technology
Free University of Bozen-Bolzano

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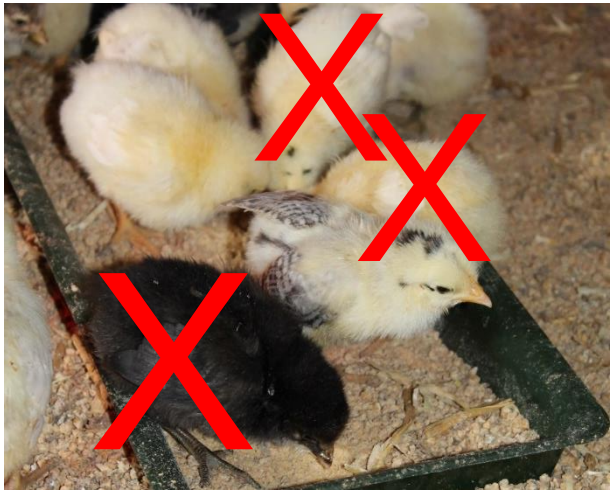
Benefit of dual-purpose chicken

- Killing of one-day old male layer chicken avoided !
- Production of meat and eggs on the same farm.

Opportunity for mountain farming in South Tyrol (Northern Italy) ?

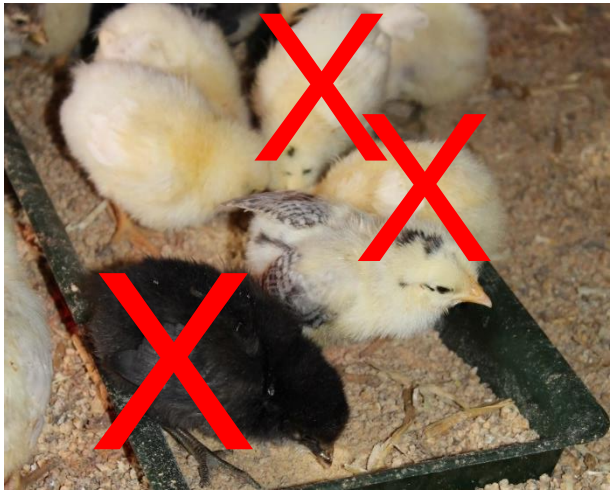


Benefit of dual-purpose chicken

- Killing of one-day old male layer chicken avoided !
- Production of meat and eggs on the same farm

Opportunity for mountain farming in South Tyrol (Northern Italy) ?

- No broiler production existent
- High market potential for regionally produced poultry meat
  Limited farmer‘s knowledge and facilities



Dual-purpose chicken

- Husbandry system ?
  - Raise males and females together during first weeks ?
  - Separate sexes during rearing period ?
  - Separate sexes after first weeks ?
- Feeding regimen ?
  - Adjust regimen based on laying hens ?
  - Adjust regimen based on broiler ?
  - Separate diets for broiler and hens ?
- Slaughter weights ?

Aim of the study

Compare two dual-purpose chicken genotypes in a production system with a mixed-sex rearing period, before males are separated for final fattening, while females are kept for an entire laying period.

Study design

- Commercial laying hen farm
- Comparison of 2 genotypes
  - Les Bleues
  - Les Bleues x New Hampshire
- 300 (♂ + ♀) one-day old chicks per genotype
- No beak trimming, no sexing

Rearing of ♂ + ♀ in floor husbandry

Starter diet

- Conventional feed
- 22% XP
- 8.5% EE (12% soybeans, 4% soy oil)
- 12.9 MJ ME

→ until 7 weeks of age

Fattening diet

- 18% XP
- 7.5% EE
- 3.5% XF
- 12.3 MJ ME

Boiler

Separation of ♂ + ♀ at 12 weeks of age
→ Final fattening stage of ♂ in a mobile house with free-range access (weekly slaughterings until 19 weeks of age)

Hens

- One laying period in the mobile house (until 75 weeks of age) with free-range access (4 m^2 / hen)

Data collection - Broiler

- Individual body weight (weekly)
- Feed consumption
- Carcass quality
  - Dressing percentage
  - Weight of legs, breast, wings (N=10)
- Health measures
  - Foot pad lesions at 3, 7 and 11 weeks of age (Hinrichsen et al., 2016)
  - Breast blisters at slaughter

Data collection – Laying hens

- Laying performance (until 75 weeks of age)
- Egg quality (every 3 weeks)
  - Egg size
  - Breaking strength and shell thickness
  - Haugh unit (albumen height)
  - Shell and yolk color
  - Yolk, albumen and sheel ratio
- Feed consumption

Data collection – Laying hens

- Behaviour
  - Time-sampling with 5 minute intervals (09:30-18:00)
  - Direct observations on the free-range
    - Distance to pod holes
    - Behaviours: sitting/lying, standing, walking, foraging and dust bathing/comfort
  - Video recordings in the mobile house
    - Behaviours: sitting on the perches, sitting on the floor, standing on the perches, standing on the floor, standing at the nest entrance, walking, feeding and drinking

Results - Broiler

Slaughter traits (♂)

(LSM ± SE)

	Genotype							P-value		
	Les Bleues			Les Bleues x New Hampshire						
Slaughter age (weeks)	**12 - 15**	**16 - 17**	**18 - 19**	**12 - 15**	**16 - 17**	**18 - 19**	**SE**	**Geno -type (G)**	**Slaugh- ter age (S)**	**G x S**
n	24	11	17	20	40	72				
LW at slaughter (g)	2,330	2,673	3,139	2,441	2,641	3,281	88.5	-	-	-
Slaughter weight (g)	1,562	1,806	2,135	1,586	1,801	2,247	67.1	-	-	-
Dressing (%)	67.1	66.7	68.1	65.4	68.1	68.5	0.86	0.87	0.01	0.05

Daily weight gain until 16th week:
Les Bleues x New Hampshire: 22.5 g
Les Bleues: 22.7 g

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Feed comsumption (not separated by genotype & mixed-sex rearing !):
Week 1 to 6: 1.9 kg started diet
Week 7 to 16: 5.2 kg broiler diet
→ Feed conversion until week 16 = 2.8 kg feed/ kg weight gain

Slaughter traits (♂)

(LSM ± SE, N=10)

Genotype	Legs (%)	Breast (%)	Wings (%)
Les Bleues	33.4 ± 0.8	15.3 ± 0.4	11.6 ± 0.5
Les Bleues x New Hampshire	34.7 ± 0.7	15.3 ± 0.4	12.3 ± 0.3



P > 0.05

Marketing as whole carcass!

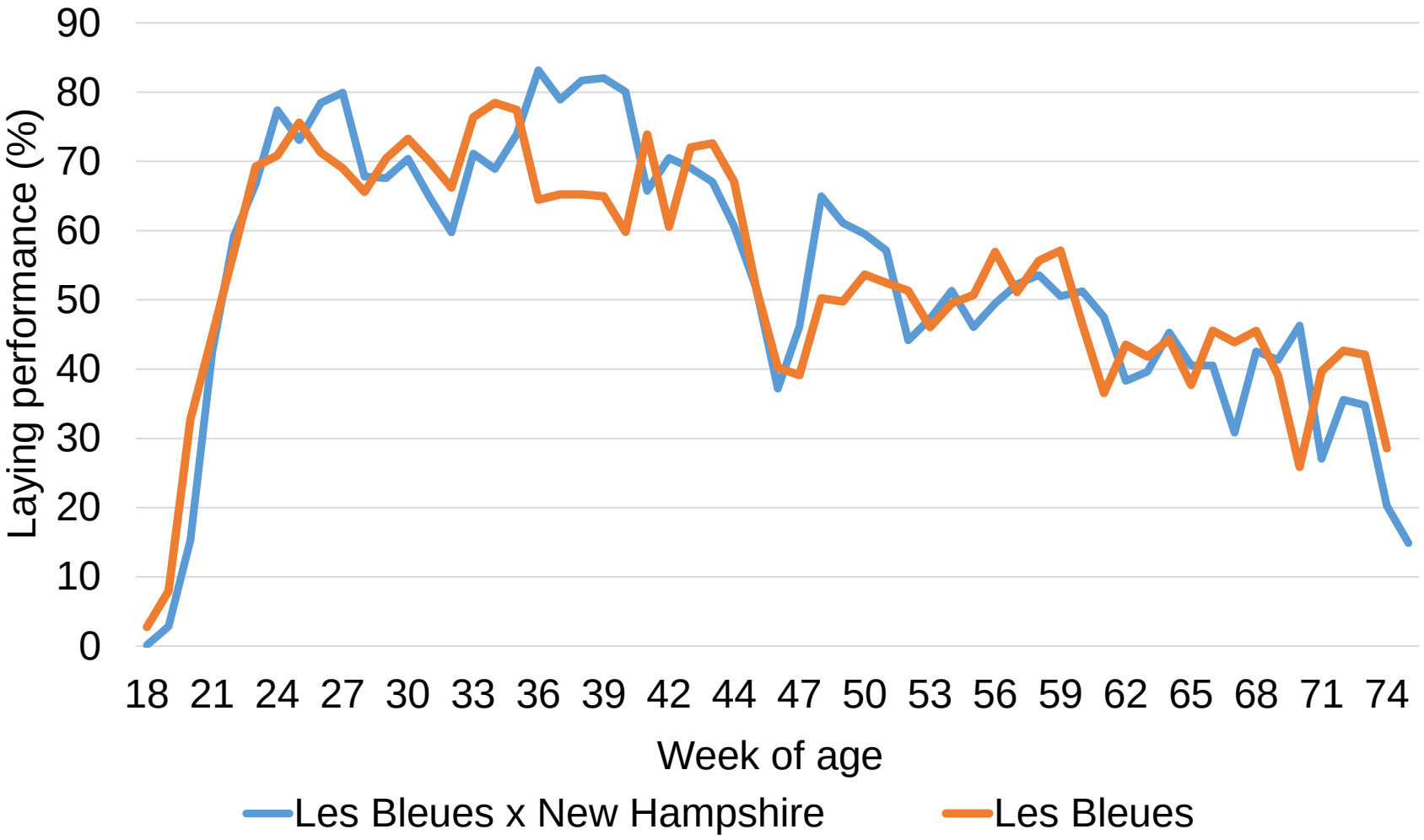
Health measures (♂)
(at 3, 7 and 11 weeks of age)

Foot pad lesions (%)	Score 1 (> 0.2 cm)	Score 2 (< 0.2 cm)	Score 3 (absent)	P-value (χ^2 test)
		Week 3		
Les Bleues	0.0	2.6	97.4	0.32
Les Bleues x New Hampshire	0.0	4.0	96.0	
		Week 7		
Les Bleues	0.0	13.9	86.9	0.46
Les Bleues x New Hampshire	0.0	13.1	86.1	
		Week 11		
Les Bleues	0.0	1.6	98.4	0.01
Les Bleues x New Hampshire	0.0	9.3	90.8	

At slaughter, 11.7% of Les Bleues and 18.3% of Les Bleues x New Hampshire with breast blisters

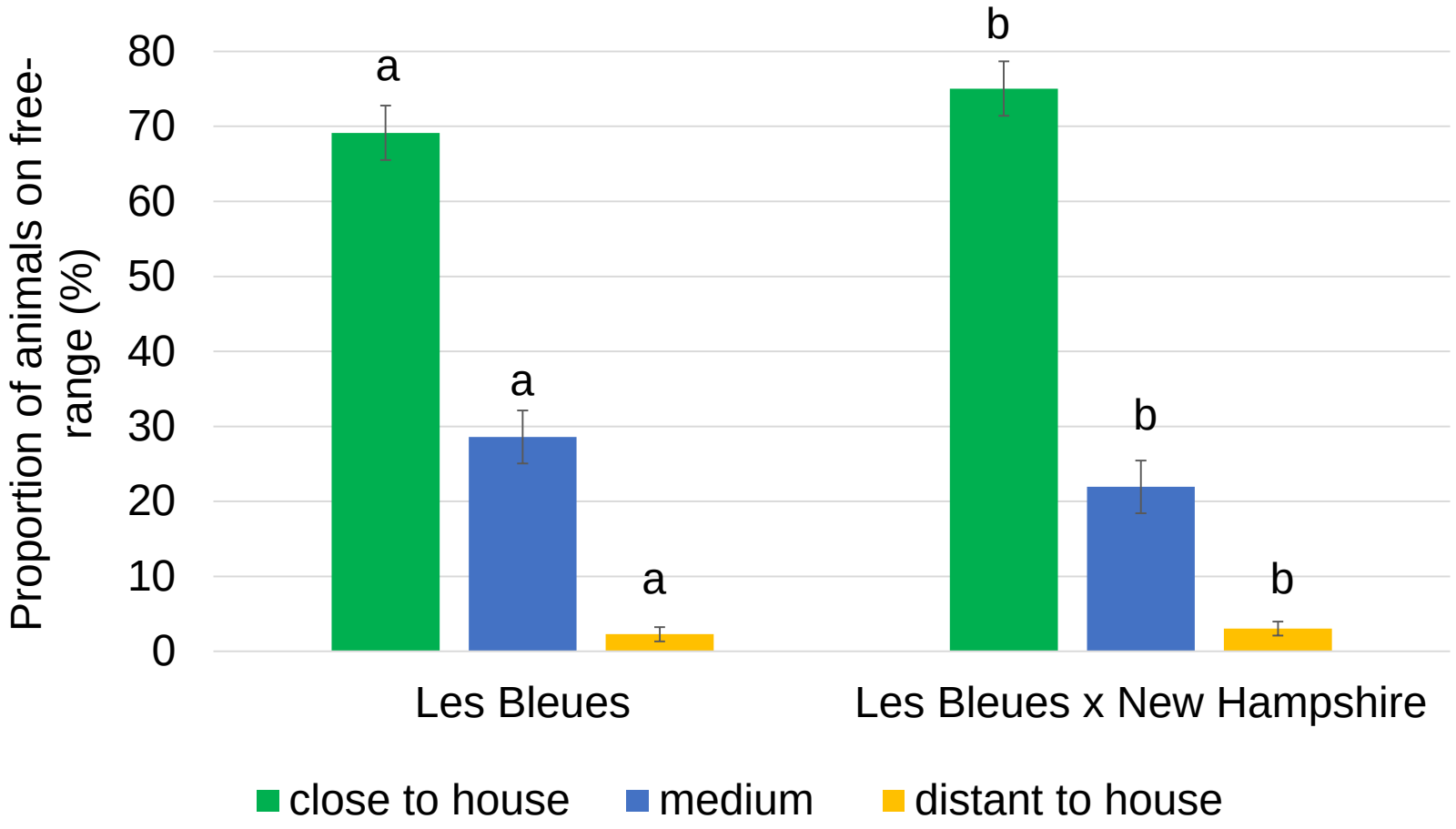
Results – Laying hens

Laying performance



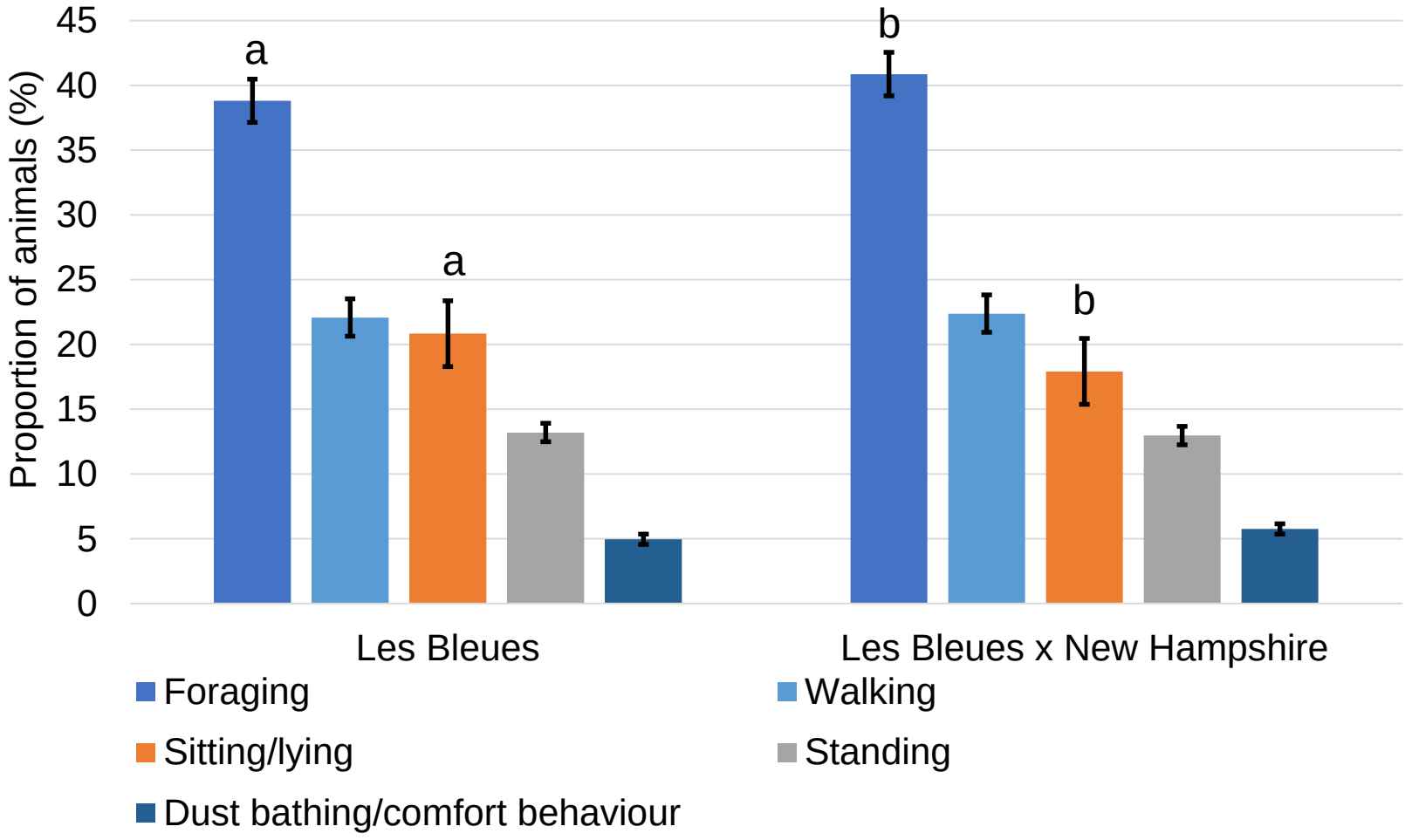
Animal location on the free-range

- Ø 24.7% of Les Bleues and 25.3% of Les Bleues x New Hampshire on the free-range



a, b: Values differ at P < 0.05 between genotypes

Behaviour on the free-range



[a, b]: Values differ at P < 0.05 between genotypes

Health measures
(at 16, 42 and 75 weeks of age)

Foot pad lesions (%)	Score 1 (> 0.2 cm)	Score 2 (< 0.2 cm)	Score 3 (absent)	P-value (χ^2 test)
		Week 16		
Les Bleues	3.5	5.7	90.8	
Les Bleues x New Hampshire	3.0	7.3	89.8	0.70
		Week 42		
Les Bleues	41.3	34.7	24.0	
Les Bleues x New Hampshire	27.0	25.6	47.4	0.02
		Week 75		
Les Bleues	32.9	29.3	37.8	0.04
Les Bleues x New Hampshire	21.3	23.0	55.7	

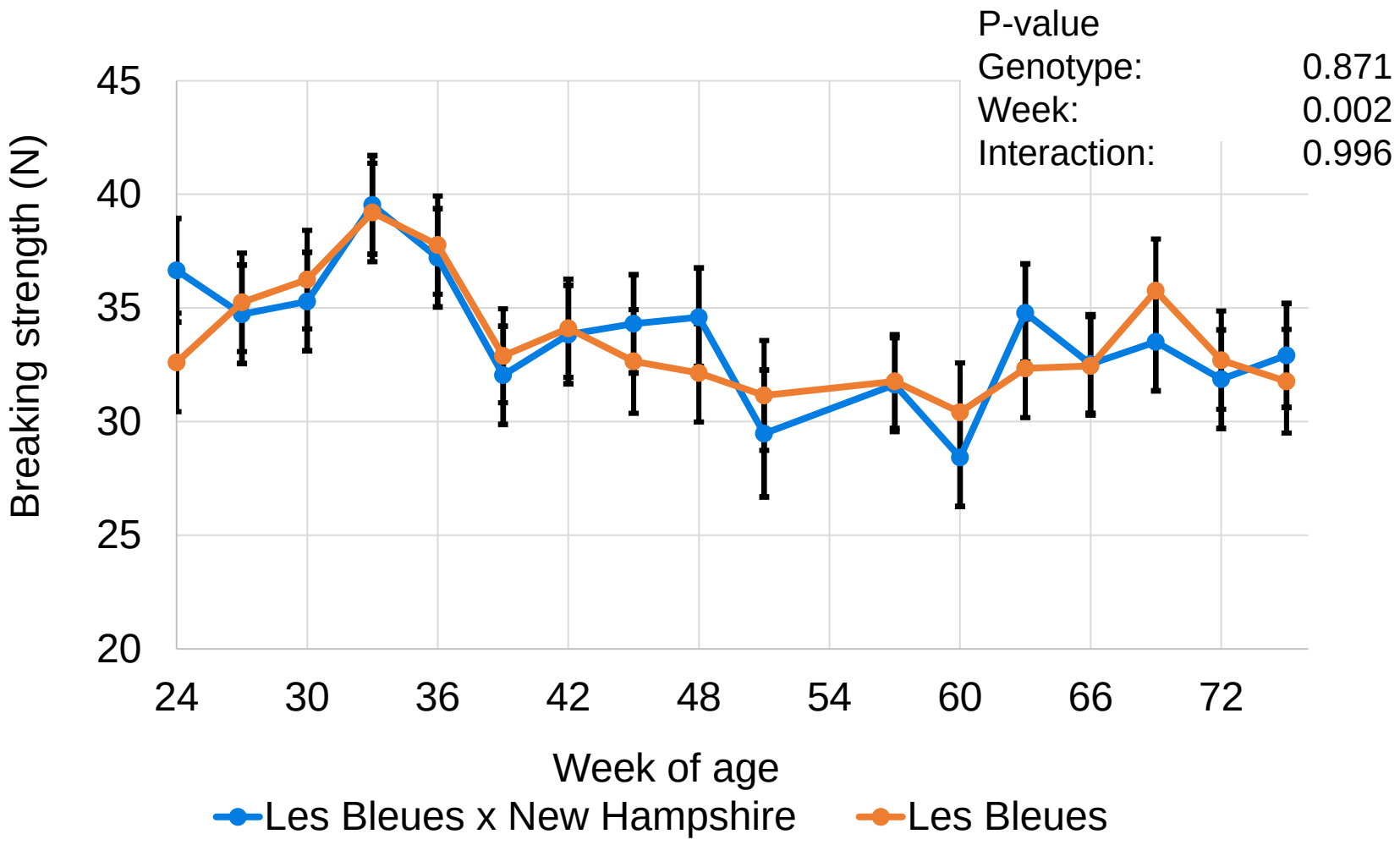
Breast blisters in 13.3% of Les Bleues and 22.6% of Les Bleues x New Hampshire at slaughter

Conclusions

- Superior growth performance of pure- compared with crossbreds, but far away from broiler hybrids
- No difference in carcass composition and meat quality between genotypes
- Crossbreds did not compensate with increased laying performance
- Intensive use of free-range
- Mobile house as additional marketing argument for small-scale farmers

Thank you for your attention!

Breaking stregth (N)



Economics (♂)

(in € per animal)

	Details		Les Bleues	Les Bleues x New Hampshire
Costs				
Chicks	incl. transport		2.76	5.00
Feed	Starter diet:	1.9 kg * 0.42 €	0.47	0.46
	Fattening diet:	5.2 kg * 0.42 €	1.28	1.27
Others	Electricity, water, cleaning		1.99	1.99
Slaughter	4 € / animal		4.00	4.00
Sum direct costs			11.76*	13.39*
Revenues				
Carcass	13 € / kg slaughter weight		22.25	22.35
Fixed costs (mobile house)			4.47	4.47
Profit			6.02	4.49

* Corrected for mortality: Les Bleues = 11.2%, Les Bleues x New Hampshire = 5.7%

Economics ( )

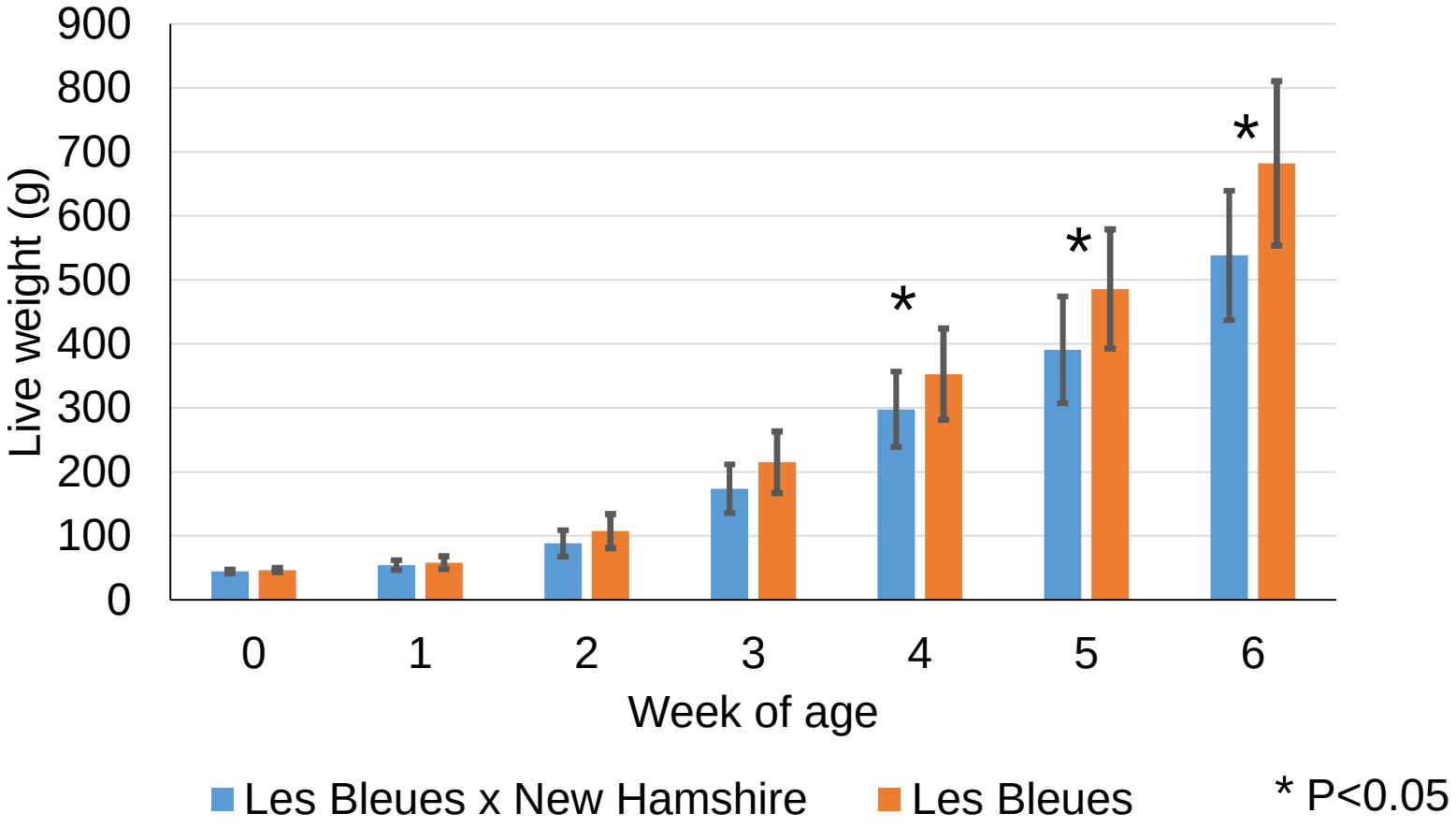
(in € per animal)

Costs	Details	Les Bleues	Les Bleues x New Hampshire
Chicks	incl. transport	2.76	5.00
Feed	Starter diet: 1.9 kg * 0.42 €	0.80	0.80
	Rearing diet: 3.3 kg * 0.42 €	1.39	1.39
	Pullet diet: 1.9 kg * 0.48 €	0.91	0.91
	Laying hen diet: 124 g/d, 49.48 kg * 0.45 €	24.24	24.24
Others	Water, bedding, cleaning, desinfection	6.78	6.78
Slaughter	4 € /animal	4.00	4.00
Sum direct costs		47.33*	47.73*
Revenues			
Egg number (18 – 75 weeks of age)		218	216
Egg price		0.40	0.40
Egg revenues		87.20	86.40
Revenue slaugter hen (8 €/kg slaughter weight)		15.02	14.69
Sum revenues		102.22	101.09
Fixed costs (mobile house)		14.45	14.45
Profit		40.44	38.91

* Corrected for mortality: Les Bleues = 15.8%, Les Bleues x New Hampshire = 10.7%

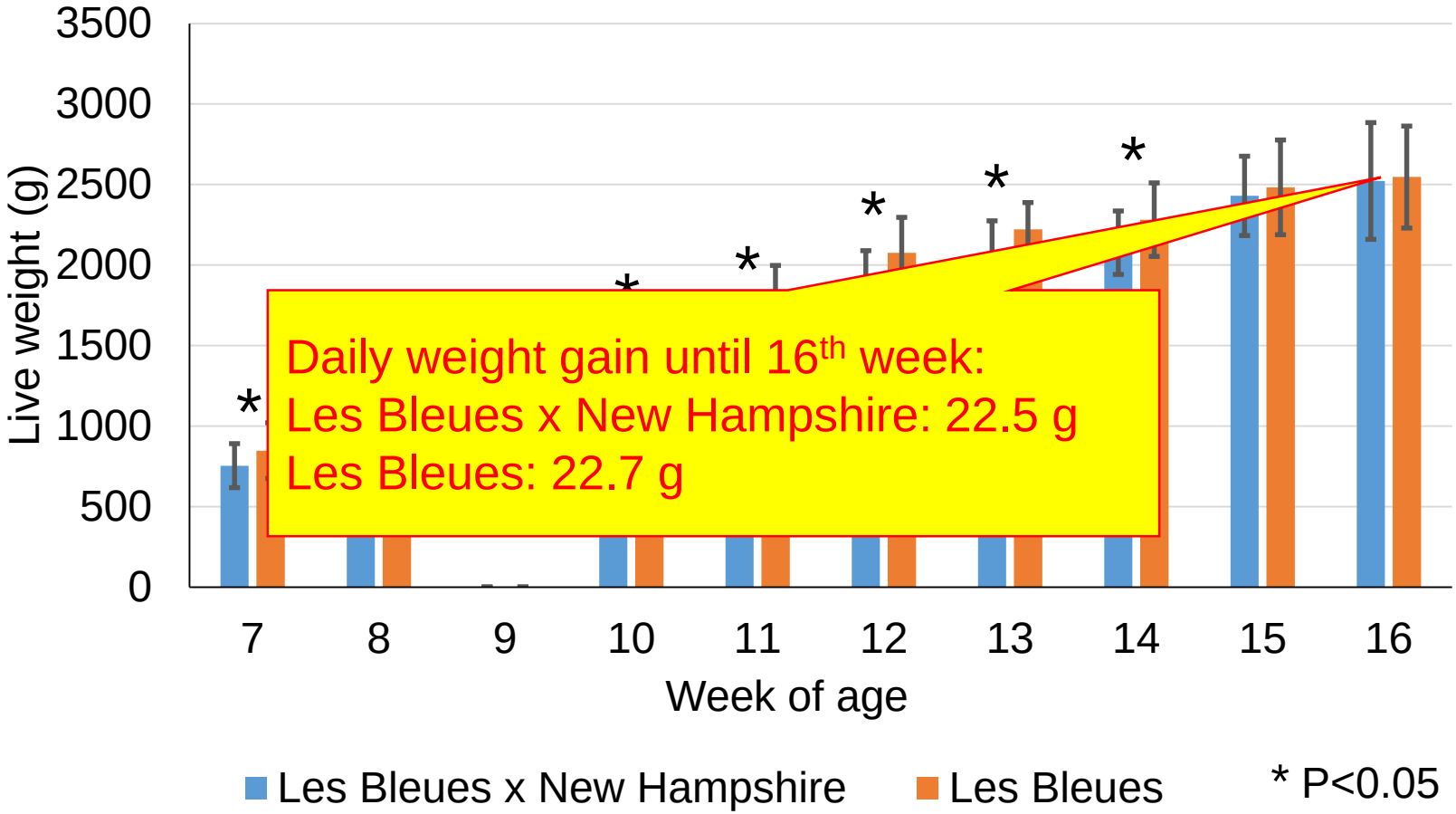
Growth performance during rearing (♂ + ♀)

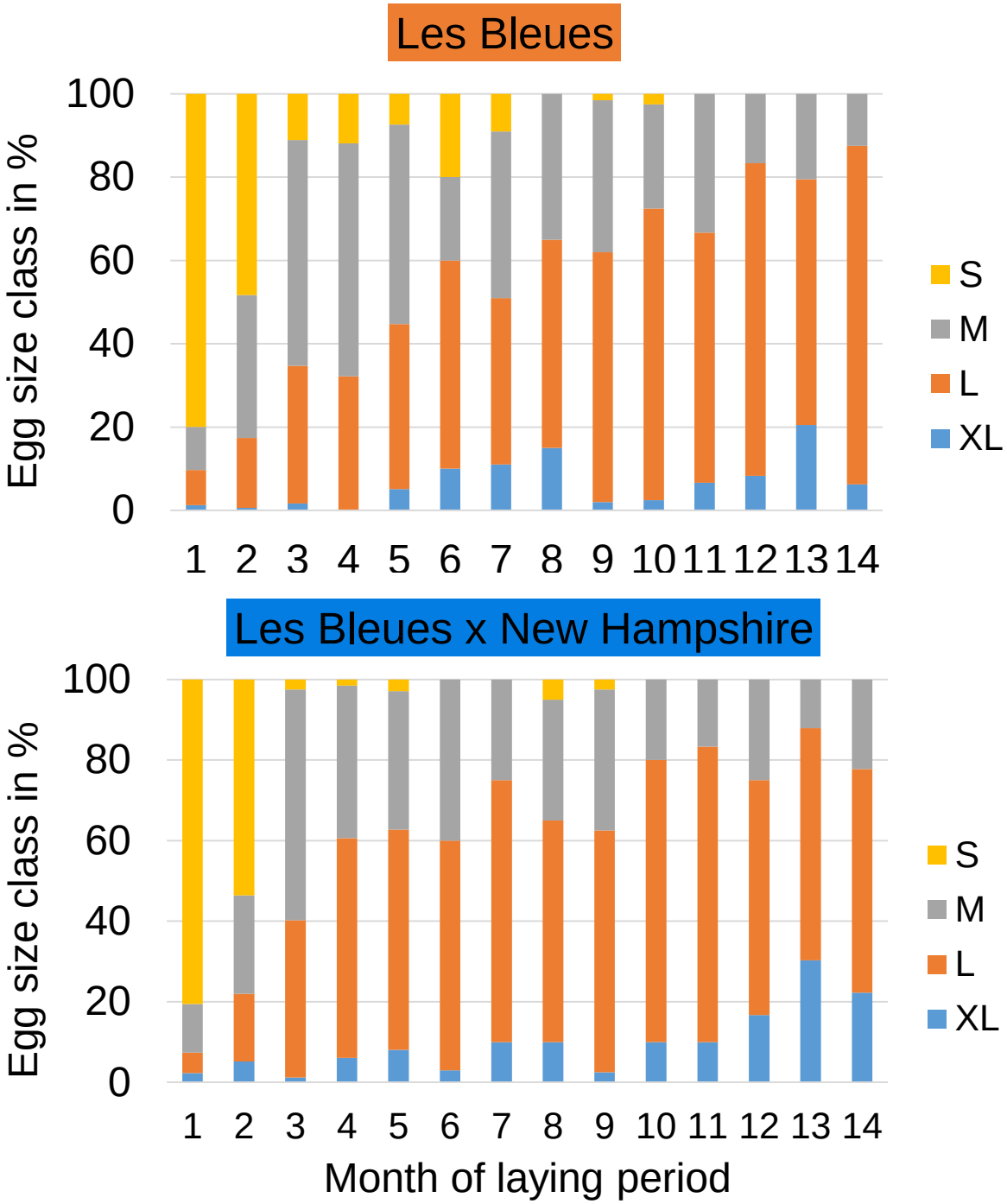
(LSM ± SD)



Growth performance (♂)

(LSM ± SD)




Les Bleues
Egg size class in %
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14
S
M
L
XL
Les Bleues x New Hampshire
Egg size class in %
100
80
60
40
20
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Month of laying period
S
M
L
XL