WP6: Innovative solutions for favouring positive behaviour, health and robustness

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DIPARTIMENTO
DI SCIENZE AGRARIE,
ALIMENTARI E AMBIENTALI

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 816172

Task 6.1 Materials and Methods

1. Preliminary study

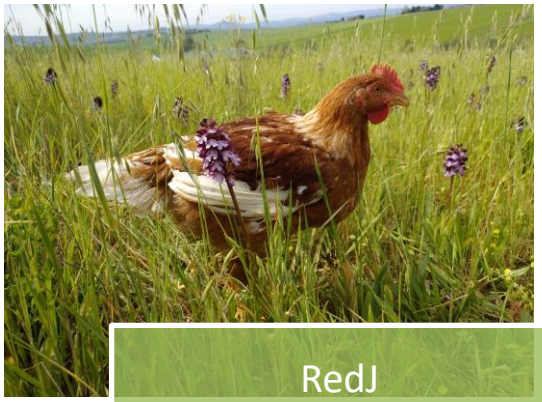
Ranger Classic
Rowan Ranger
Ranger Gold
Red J
Naked Neck

Dual purpose: Lohamn Dual

Italian crossbreed:
Robusta maculata x Sasso
Bionda piemontese x sasso

Mattioli et al., 2022, Plos One

2. Experimental trials



RedJ

Naked neck

Dual Purpose

Cross Breed

Task 6.1 Materials and Methods

Two cycles of rearing. Length of cycle will be 100±10 days in relation to the reaching of commercial weight.

Autumn/Winter= October/January	Spring/Summer= March/June
Sorghum vs spontaneous pasture	spontaneous pasture vs no pasture

outdoor pens with sorghum

outdoor pens without pasture

outdoor pens with spontaneous pasture

outdoor pens without pasture

- A synthetic index is being developed with a focus on exploratory behavior, physiological and immune parameters, performance and meat quality

Results

- Starting from 206 variables analyzed, 7 Principal Components (PCs) have been created
- Accordingly, we chose only two traits (in bold and italic, + or -), which explains a significant amount of variability for each PC.

	PC1 Behaviour [28.17%]		PC2 Weight traits [48.05%]		PC3 Physical -chemical traits [15.92%]		PC4 Meat oxidative status [20.24%]	
+	***Running***	***0.73***	***Carcass Weight***	**0.99**	***Drip loss (drumstick)***	**0.70**	***Lipids (drumstick)***	**0.67**
	Attack	0.65	Drumstick (no bone)	0.96	b* colour (breast)	0.68	MDA (breast)	0.59
	Swell	0.57	Breast Weight	0.95	Drip loss (breast)	0.60	Retinol (breast)	0.44
	Rest	0.56	Bust Yield	0.92	WHC (breast)	0.59	Retinol (drumstick)	0.43
	Allo-grooming	0.55	Breast Yield	0.91	b* colour (drumstick)	0.31	Tocols (drumstick)	0.37
	Grooming	0.48	Bone Weight	0.88	White Striping (WS)	0.30	Tocols (breast)	0.36
	Escape	0.44	Live Weight	0.85				
	Grass Pecking	0.42	Tibia Length	0.84				
			Breast Thickness	0.76				
			Sternum Length	0.70				
			Plantar Lesions	0.43				
-	Walking	-0.40	Neck score	-0.38	a* colour (drumstick)	-0.36	Total lipids (breast)	-0.44
	Stretching	-0.52	***Breast score***	**-0.58**	L* (drumstick)	-0.47	Carbonyls (drumst.)	-0.45
	Hide	-0.62			***a* colour (breast)***	**-0.48**	***Carbonyls (breast)***	**-0.54**
	Other_peck.	-0.71						
	Sand	-0.71						
	Scratch	***-0.74***						

PC5 Meat fatty acids profile [32.29%]		PC6 *In vivo* oxidative status and fatty acids profile [24.04%]		PC7 Blood traits [26.92%]	
PUFA (breast)	**0.882**	***PUFA blood***	**0.817**	***HCT (%)***	**0.727**
C18:2n-6, LA (breast)	0.872	SFA blood	0.800	Lysozyme	0.649
C18 (breast)	0.862	C18 blood	0.796	ROMS	0.274
C18:1n-9 (breast)	0.852	n-6 blood	0.750	PAO	0.040
MUFA (breast)	0.846	C18:2cis n-6, LA blood	0.647		
C20:2 (breast)	0.815	C16 blood	0.645		
n-3 (breast)	0.814	C20:4n-6, AA blood	0.521		
C20:5n-3, EPA (breast)	0.786	C20:5n-3, EPA blood	0.519		
C22:2 (breast)	0.779	C18:3 n-3, α-ALA blood	0.500		
C22:5n-3, DPA (breast)	0.748	n-3 blood	0.376		
C22:4 (breast)	0.739	C18:1n-9 blood	0.363		
C20:4n-6, AA (breast)	0.733	MUFA	0.362		
C14 (breast)	0.676				
C18:3n-3, α-ALA (breast)	0.603				
C16:1 (breast)	0.526				
C17:1 (breast)	0.519				
C14 (drumstick)	0.510				
C22:6n-3, DHA (breast)	0.493				
C14:1 (drumstick)	0.413				
C16 (drumstick)	0.384				
C16:1 (drumstick)	0.384				
C20:5n-3, EPA (drumstick)	-0.327	***MDA blood***	**-0.330**	***Heterophiles/lymphocytes***	**-0.352**
C18 (drumstick)	-0.331				
C22:2 (drumstick)	-0.359				
n-3 (drumstick)	-0.483				
PUFA (drumstick)	-0.493				
C22:6n-3, DHA (drumstick)	-0.503				
C18:1cis9 n-9 (drumstick)	-0.519				
C22:4 (drumstick)	-0.565				
C22:5n-3, DP (drumstick)	-0.566				
C20:4n-6, AA (drumstick)	**-0.572**				

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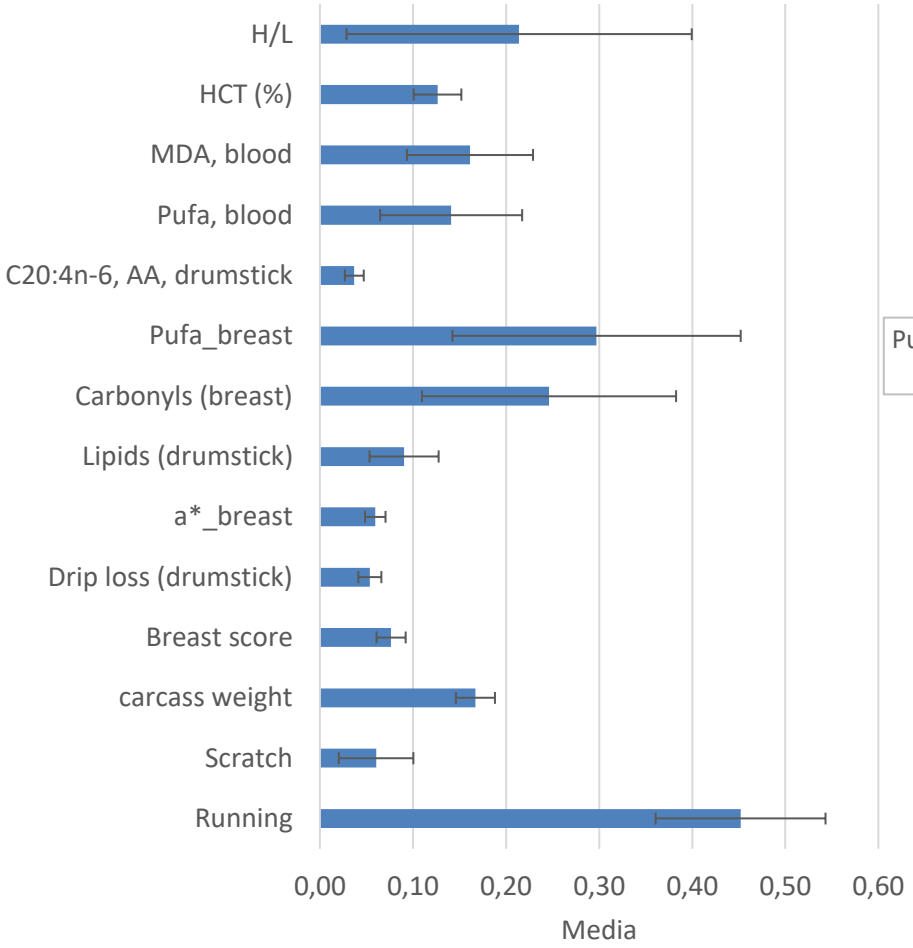
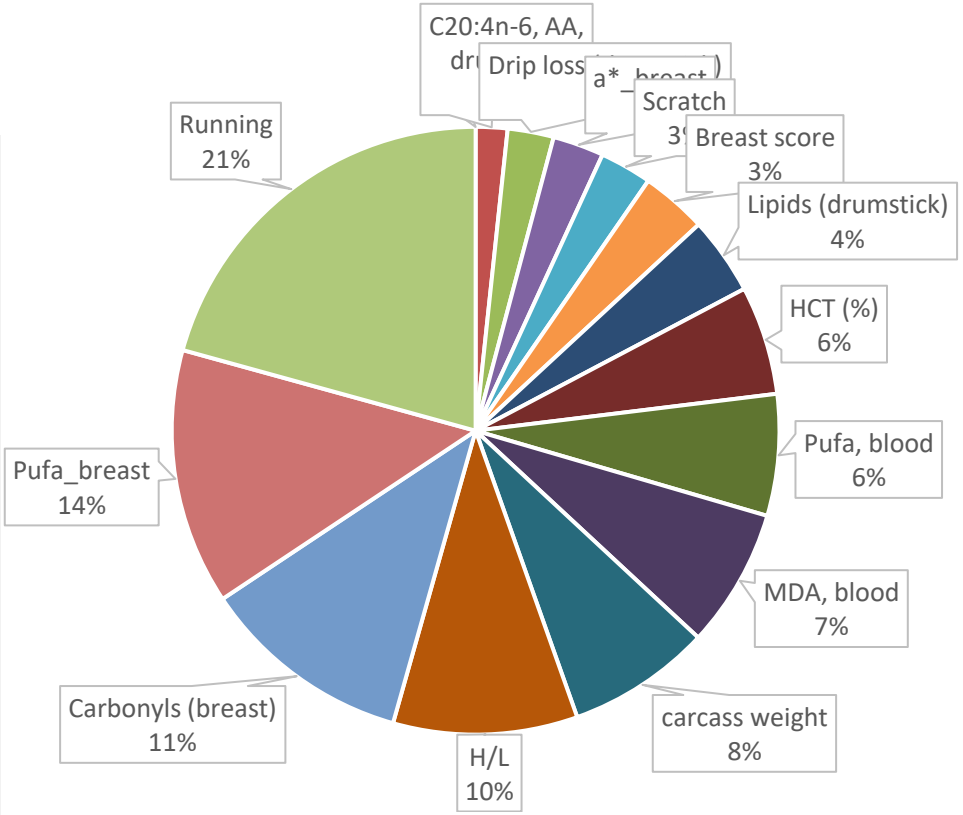
For accuracy/weight testing of the criteria



Statistic variance



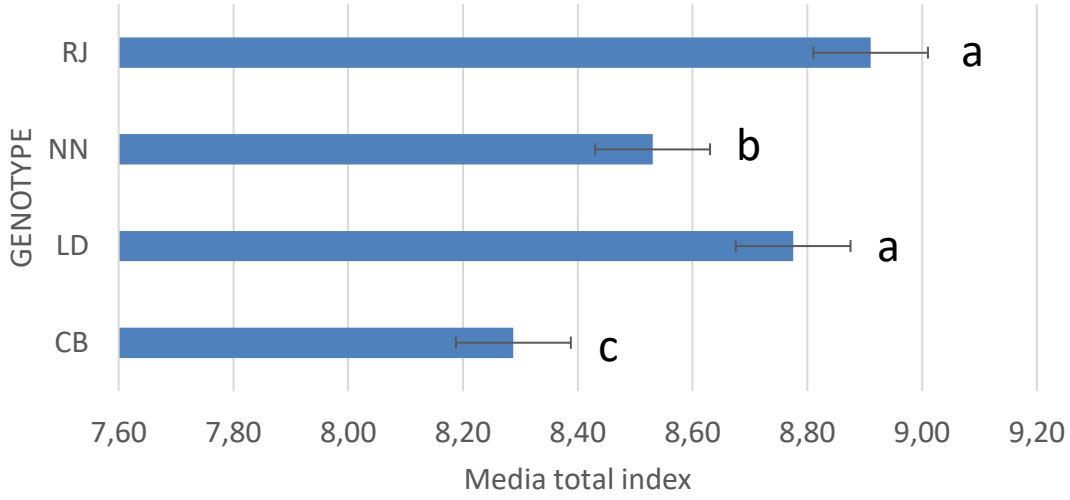
Results

- The traits were multiplied for the amount of variability explained and thus, normalized.
- The sum of the value resulted has been used as an index of adaptability (AI)

		CB		LD		NN		RJ			P value		
	Mean index value	ENR	NO ENR	ENR	NO ENR	ENR	NO ENR	ENR	NO ENR	RMSE	GEN	ENR	INT
PC1 +	Running	0.08	0.00	0.18	1.09	0.12	0.55	1.00	0.79	0.082	<0.001	0.000	0.000
PC1 -	Scratch	0.01	1.00	0.04	0.01	0.00	0.09	0.00	0.01	0.026	0.000	0.000	0.000
PC2 +	Carcass weight	0.69	0.70	0.41	0.42	0.95	0.90	1.00	1.00	0.120	0.000	0.729	0.803
PC2 -	Breast score	0.98	1.00	0.95	0.97	0.77	0.77	0.52	0.49	0.116	0.000	0.990	0.843
PC3 +	Drip loss (drumstick)	1.00	1.00	0.30	0.33	0.39	0.30	0.13	0.13	0.114	0.000	0.536	0.314
PC3 -	a*_breast	0.82	0.27	1.00	0.99	0.60	0.57	0.72	0.72	0.221	0.002	0.066	0.107
PC4 +	Lipids (drumstick)	0.58	0.58	0.71	0.72	0.53	0.53	1.00	0.97	0.084	0.000	0.748	0.180
PC3 -	Carbonyls (breast)	0.68	1.00	0.27	0.57	0.28	0.16	0.28	0.28	0.179	0.000	0.059	0.029
PC5 +	Pufa_breast	0.56	0.51	0.35	0.38	0.92	0.95	0.93	1.00	0.157	0.000	0.682	0.884
PC5 -	C20:4n-6, AA, drumstick	0.33	0.30	1.00	0.58	0.36	0.51	0.26	0.39	0.206	0.000	0.608	0.037
PC6 +	Pufa, blood	0.92	0.79	1.00	0.98	0.85	0.81	0.67	0.91	0.147	0.003	0.793	0.019
PC6 -	MDA, blood	0.37	0.43	0.66	0.67	1.00	0.80	0.71	0.55	0.193	0.000	0.342	0.553
PC7 +	HCT (%)	0.97	0.90	1.00	1.00	0.91	0.93	0.83	0.94	0.099	0.000	0.402	0.031
PC7 -	H/L	0.56	0.61	0.54	0.53	1.00	0.59	0.95	0.64	0.170	0.000	0.004	0.013
	AI	**8.55**	**9.09**	**8.41**	**9.24**	**8.68**	**8.46**	**9.00**	**8.82**	**0.898**	**0.029**	**0.787**	**0.033**
	SEM	*0.33*	*0.35*	*0.25*	*0.24*	*0.24*	*0.24*	*0.24*	*0.23*				

Results

Provisional adaptability index



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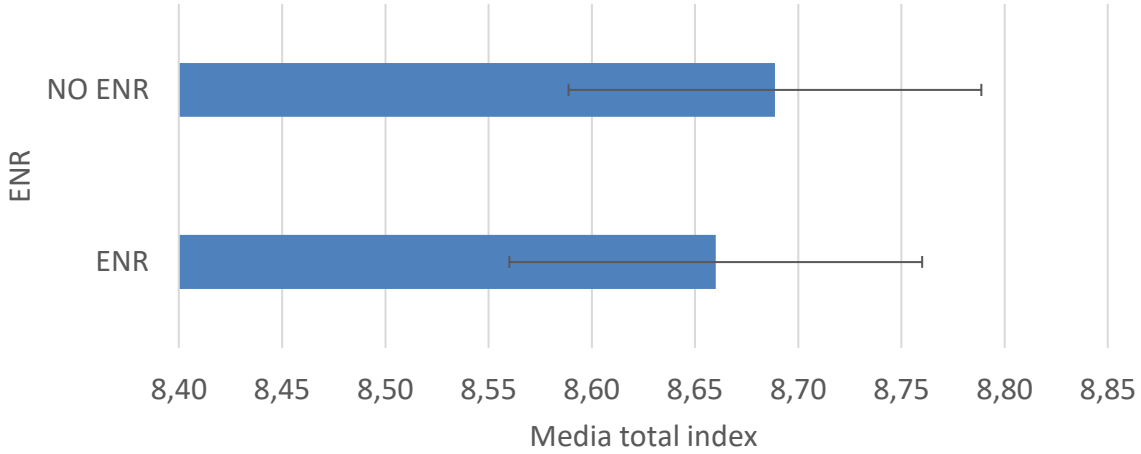
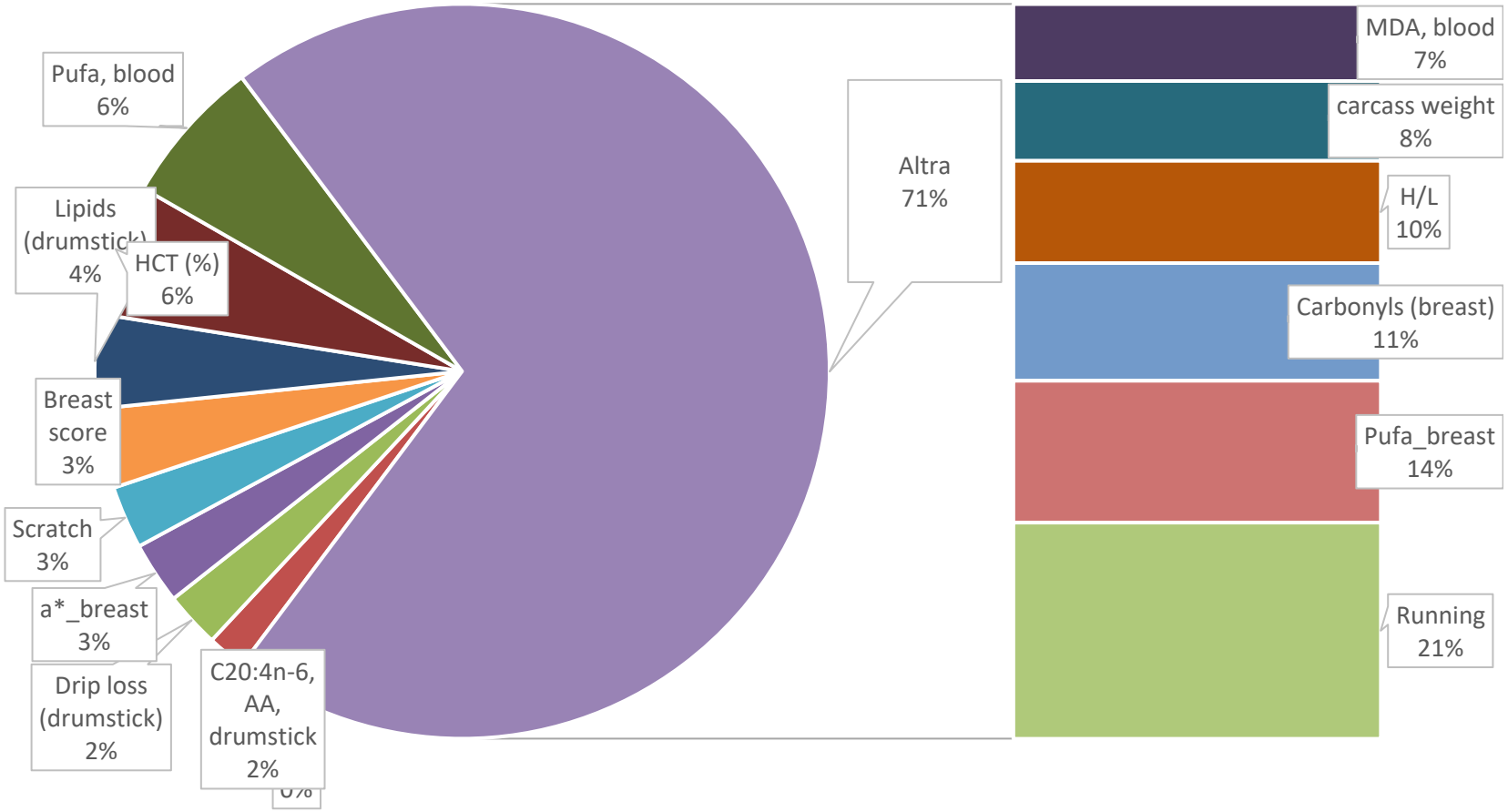


P=0.787

Results

Excluded value < 7%



Results

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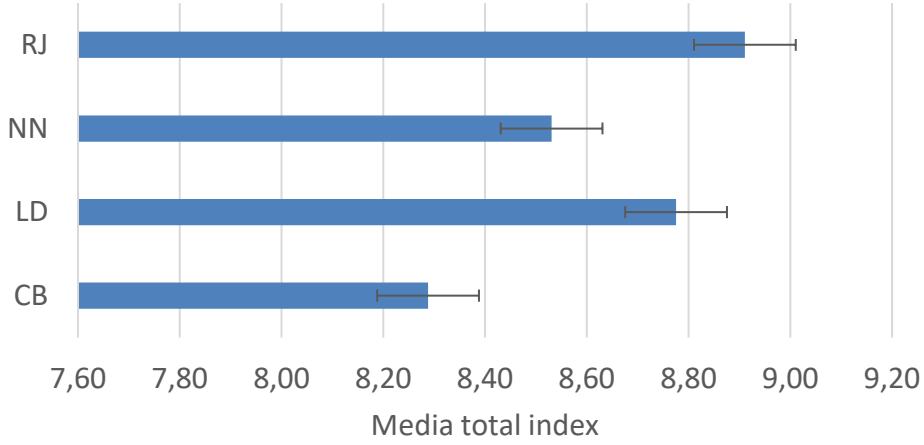

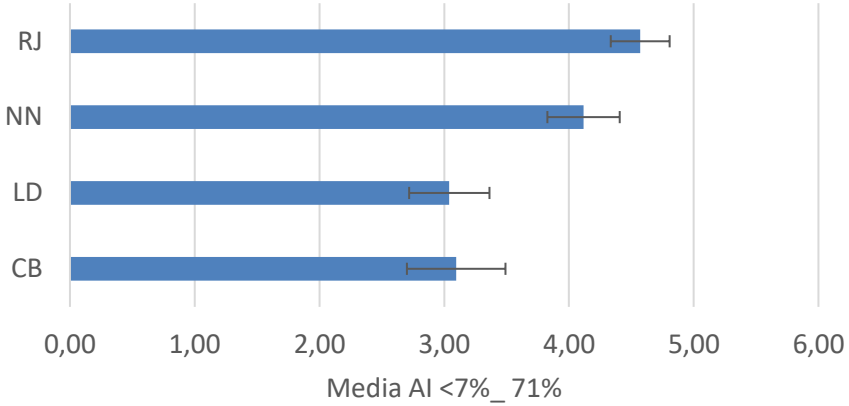

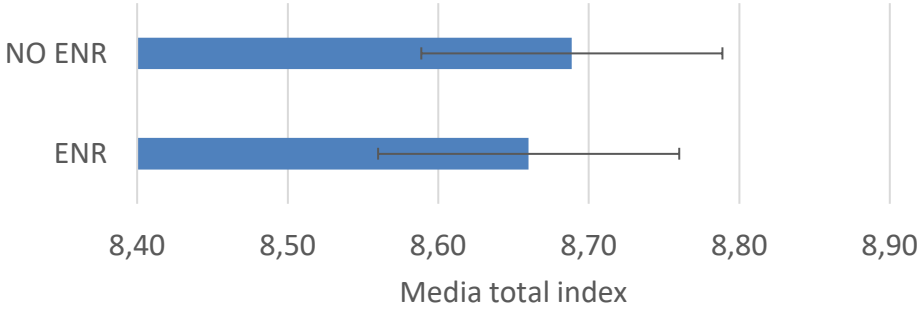

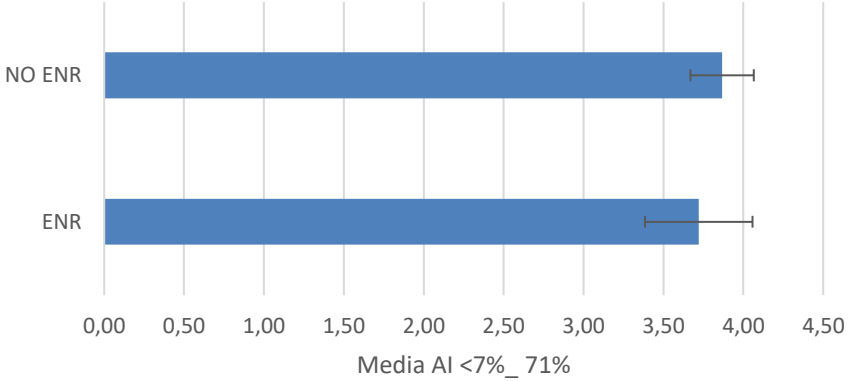

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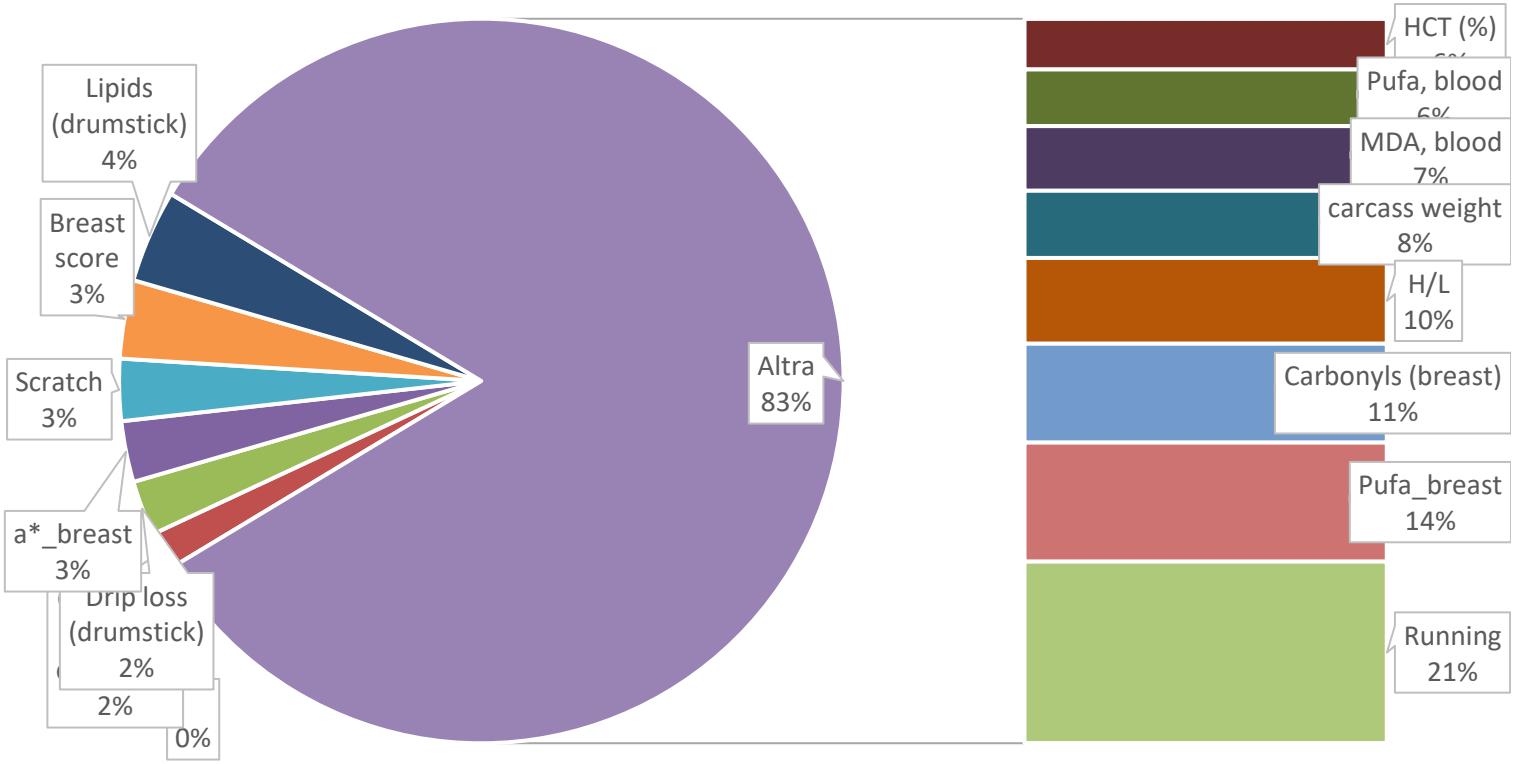

Results

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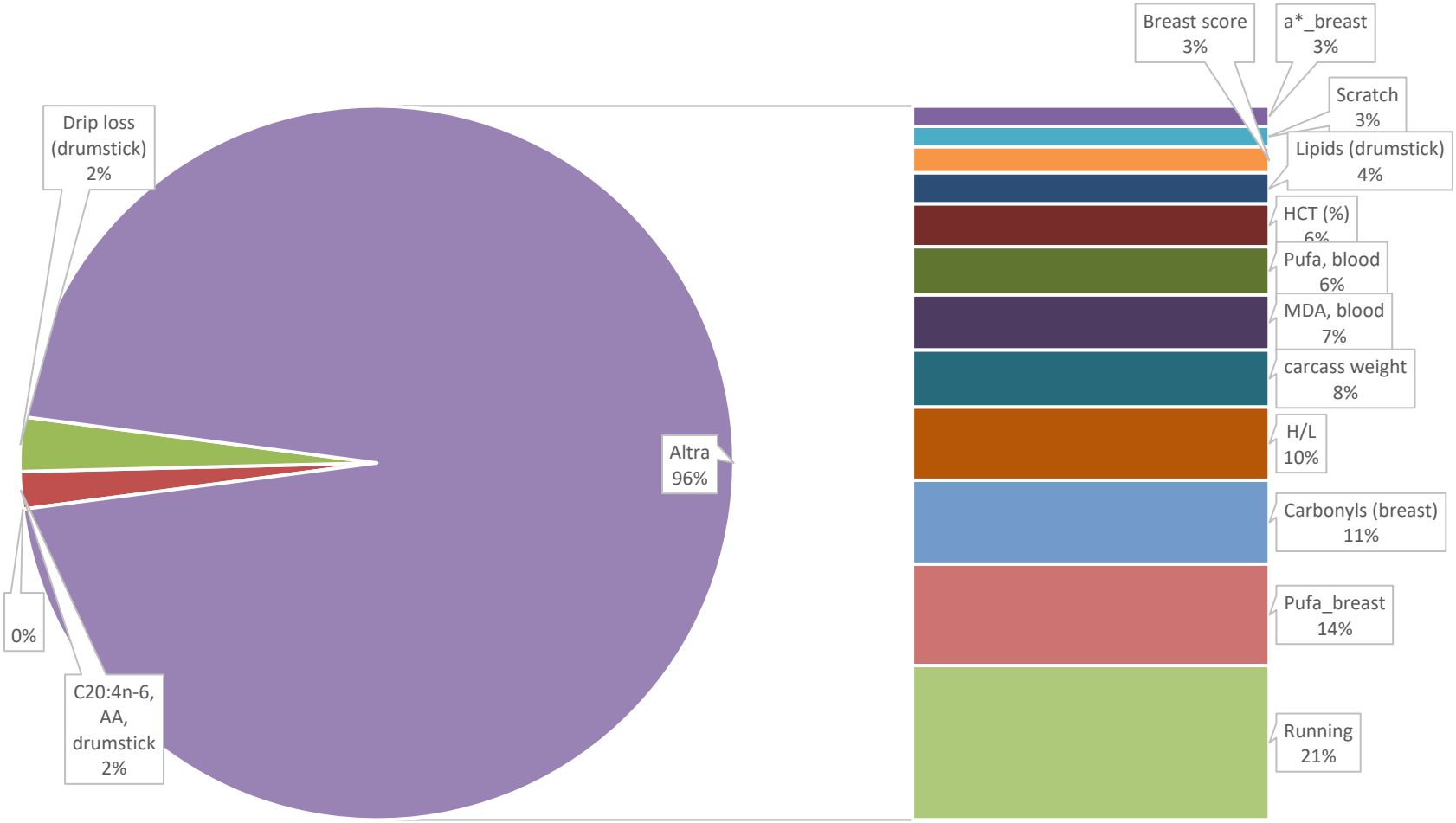
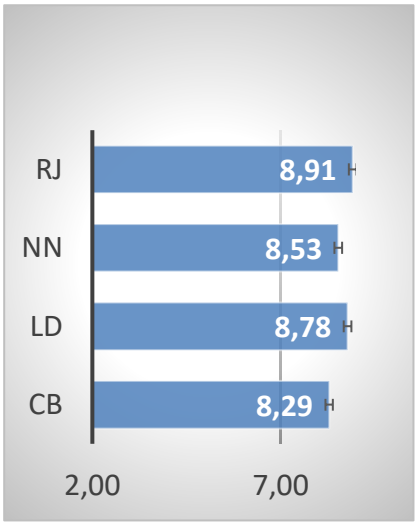
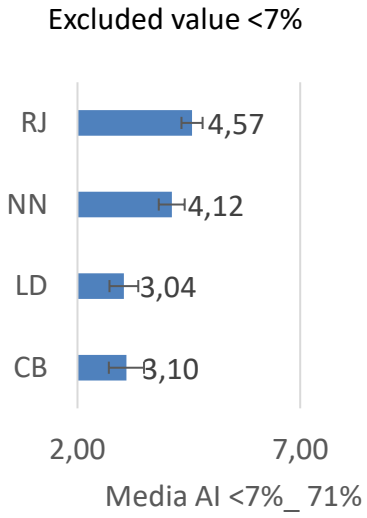
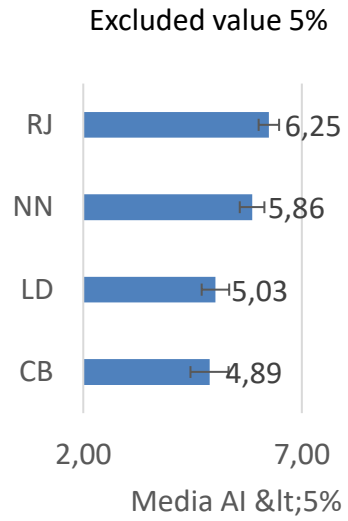


Results


RJ
8,91
NN
8,53
LD
8,78
CB
8,29
2,00
7,00


Excluded value <7%
RJ
4,57
NN
4,12
LD
3,04
CB
3,10
2,00
7,00
Media AI <7%_ 71%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RJ
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LD
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CB
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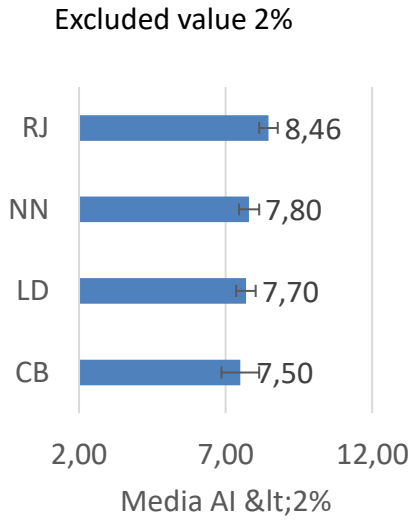
7,00
Media AI <5%


Excluded value 2%
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LD
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CB
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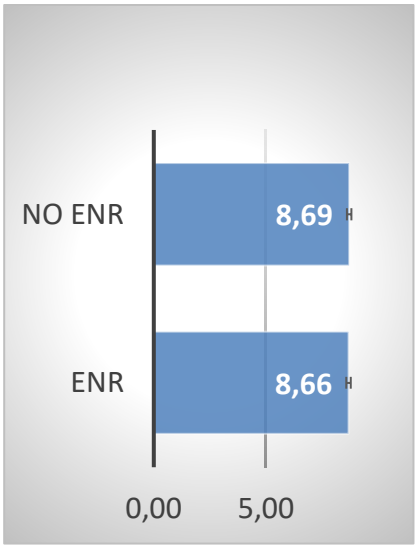
2,00
7,00
12,00
Media AI <2%


NO ENR
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ENR
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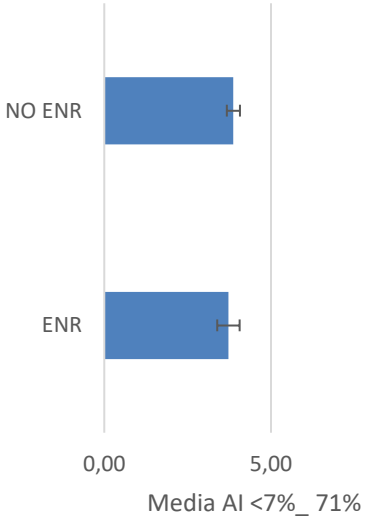
NO ENR
ENR
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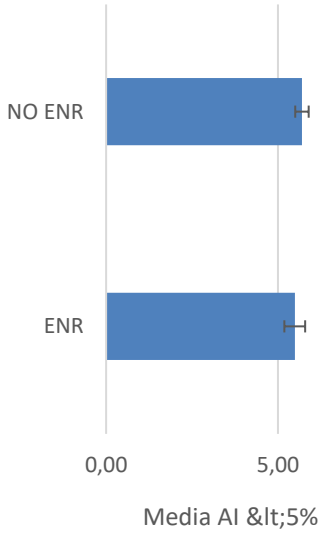
Media AI <7%_ 71%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ENR
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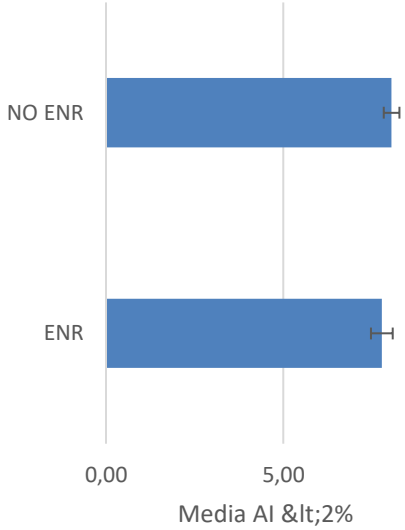
Media AI <5%


NO ENR
ENR
0,00
5,00
Media AI <2%

PPILOW - Take home message

These preliminary results suggested that:

- ✓ The GEN mainly affect the adaptability to rearing system
- ✓ The ENR seems do not affect the adaptability of chickens
- ✓ The choice of the criteria for the index building is very important, more criteria produce more robust index
- ✓ To reduce the criteria number (necessary for large-scale/on-farm application) is needed to refine the index by including more data (chicken genotypes) in the analysis

The tested genotypes are SG, therefore very similar in characteristics, consequently the variance explained by the criteria is limited.
Probably applying the index to extreme lines would be more explanatory.

Thanks for your attention

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Thank you for your attention and involvement!

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 816172