



INTERNATIONAL

The key to your profit!



Nutrition in alternative systems

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What do we have to do? Something?

Energy

Amino acids

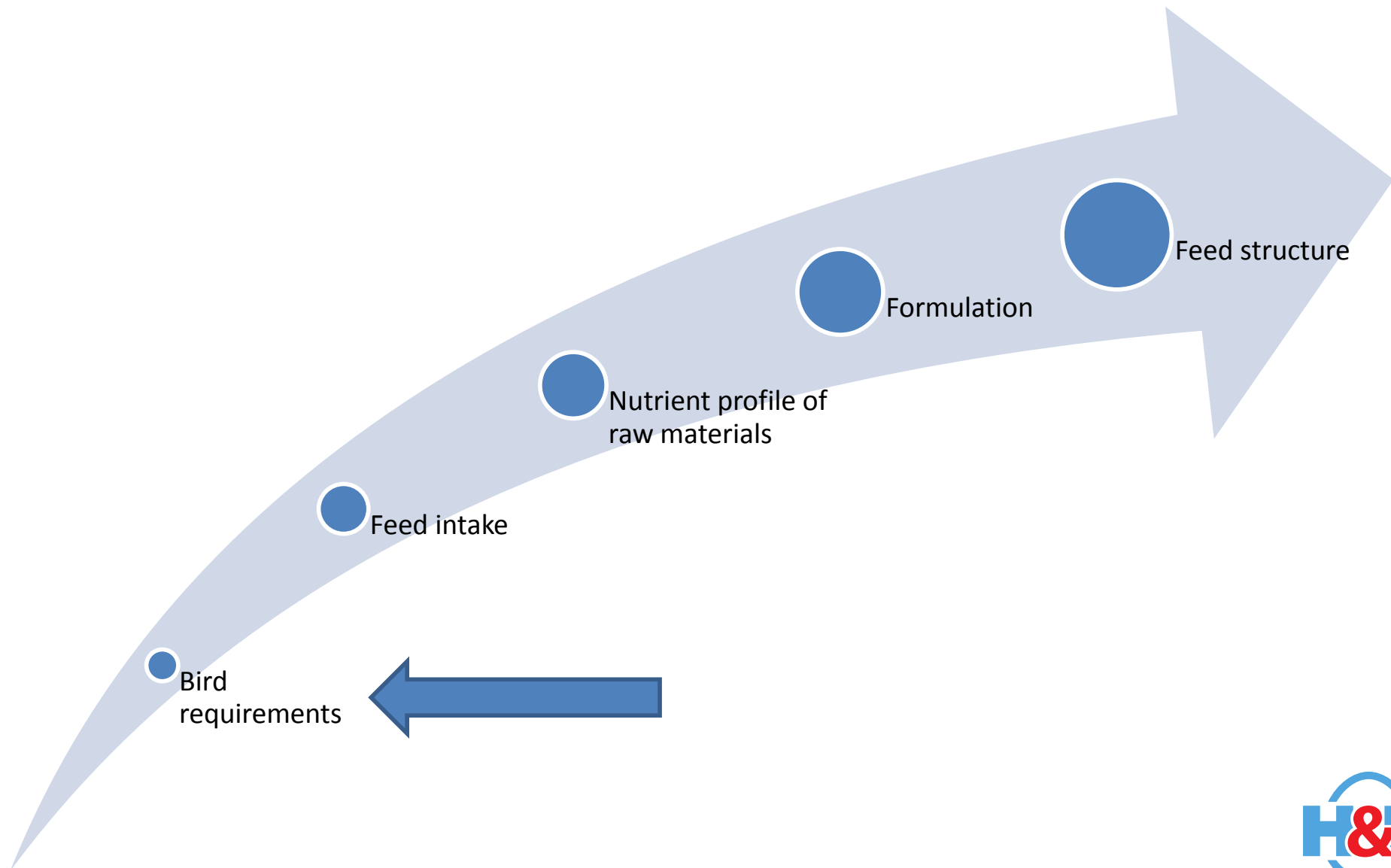
Vitamines

Fiber

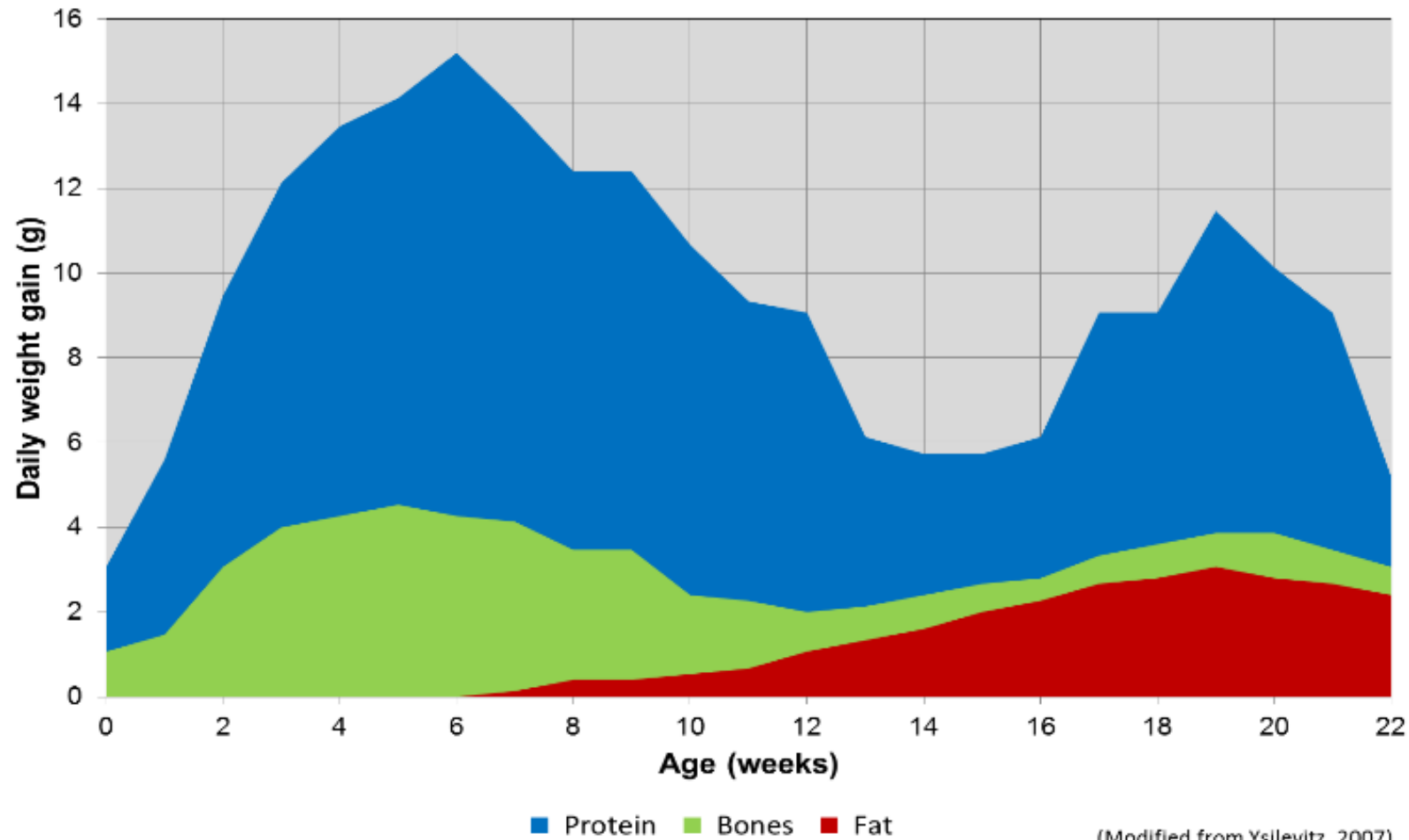
Minerals

Electrolytes

5 steps in feeding



Pullets needs



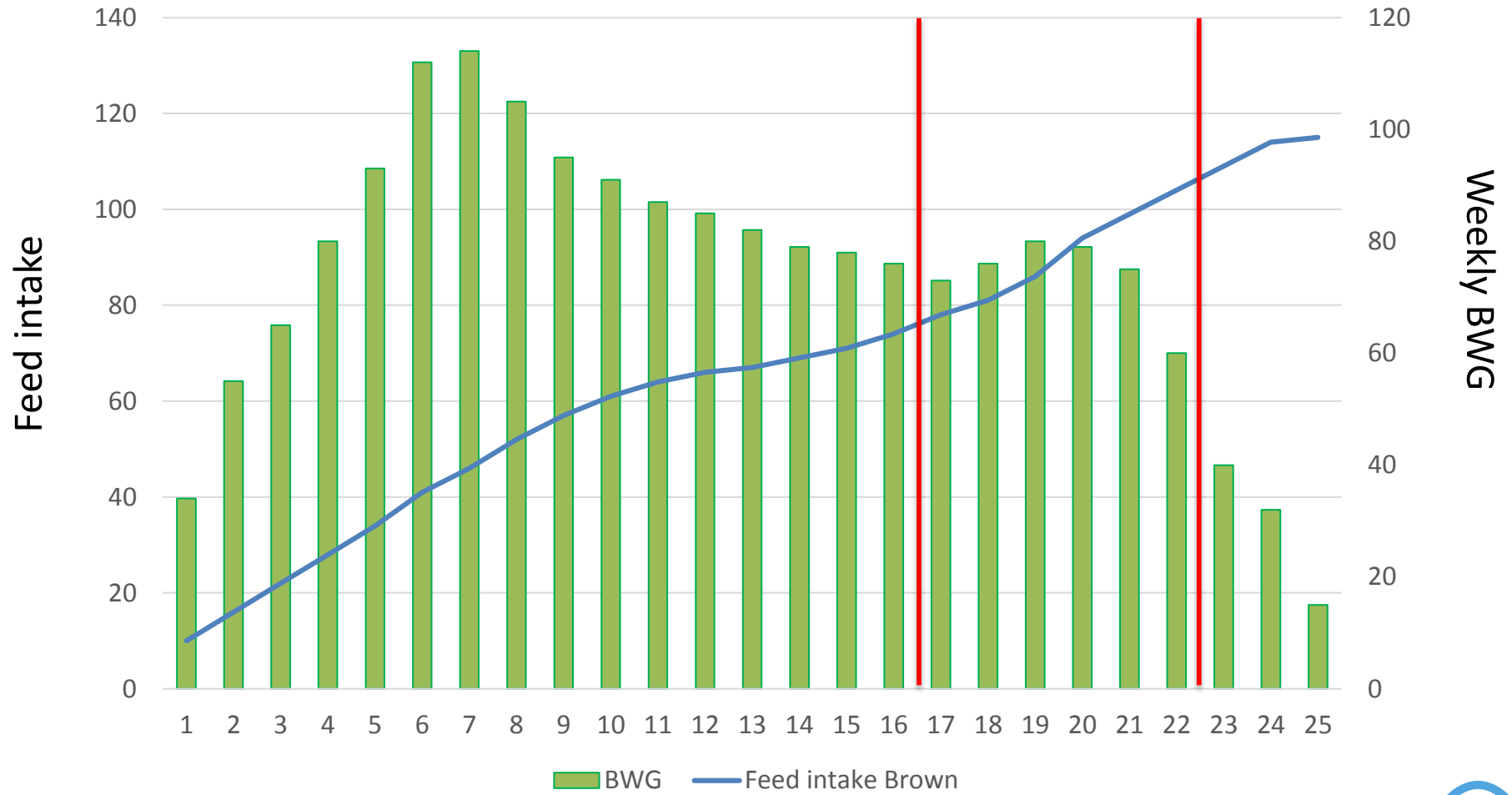
(Modified from Ysilevitz, 2007)

Hen performance, 24-59 wk

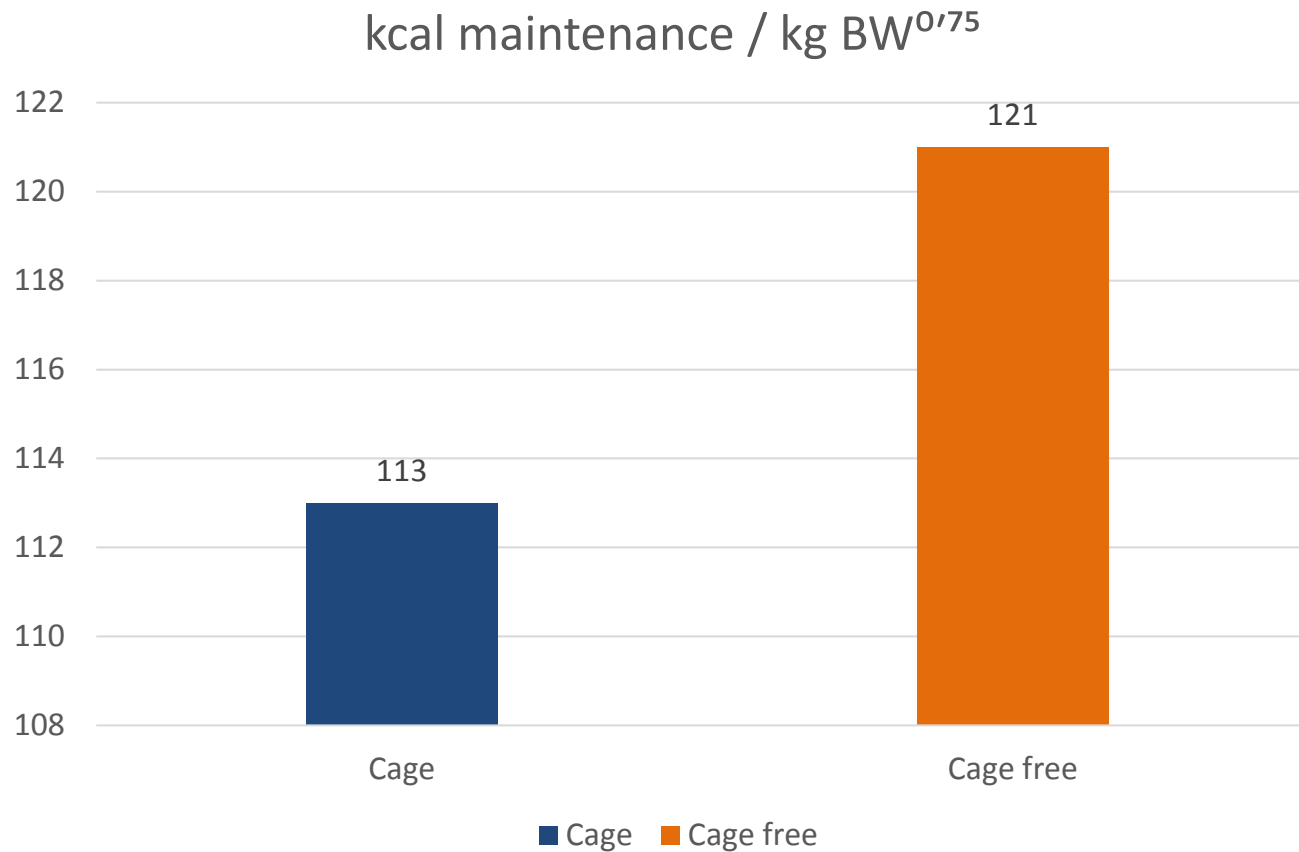
Main effect: initial BW

	High (1.733 g)	Low (1.606 g)	<i>P</i>
Egg prod. (%)	91.2	90.5	NS
ADFI (g)	113.9^a	111.0^b	***
Egg mass (g/d)	58.5^a	57.0^b	**
Egg weight (g)	64.2^a	63.0^b	***
FCR	1.95	1.95	NS
BW gain (g)	313	307	NS

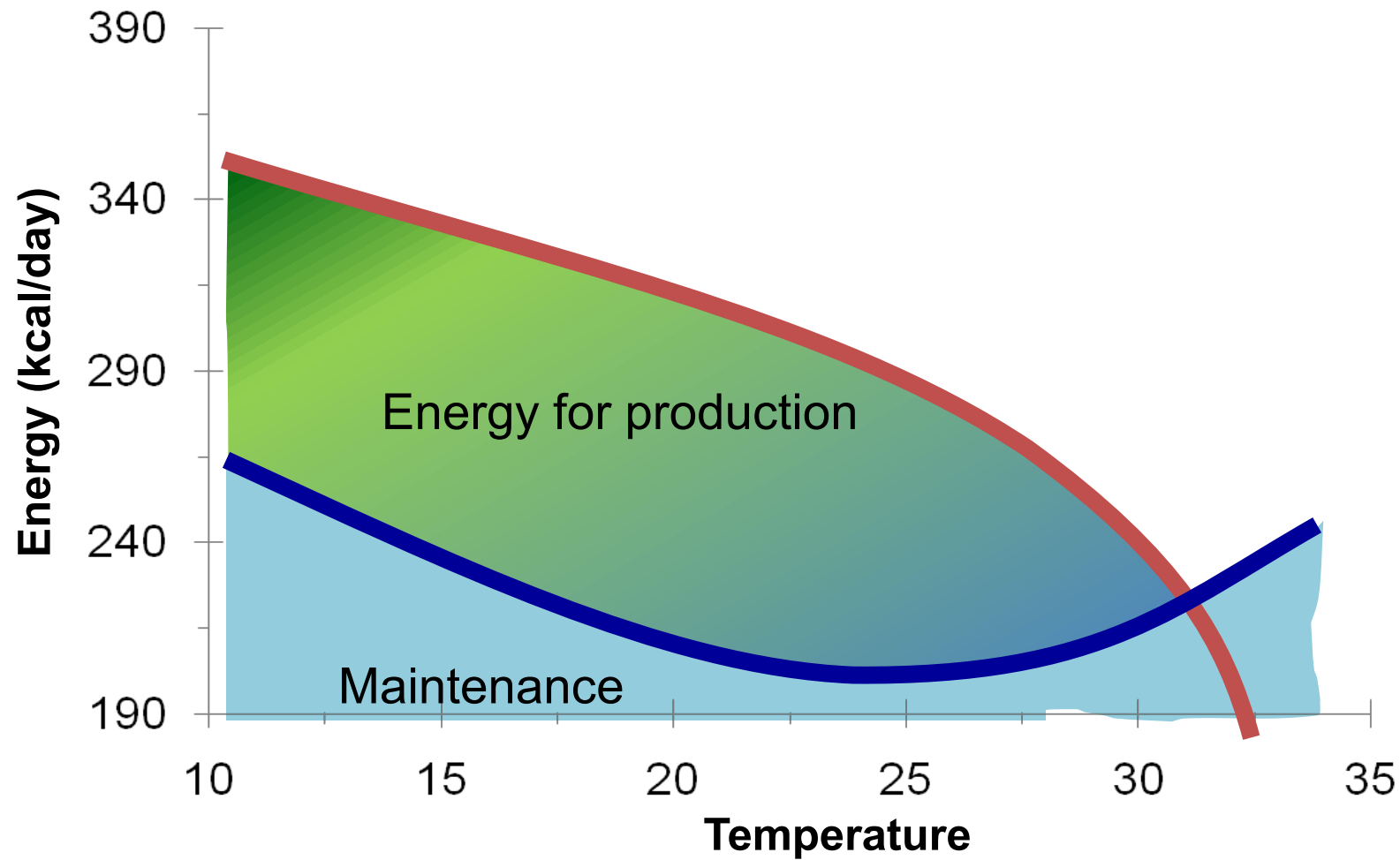
Feed intake



Activity increases



Effect of the temperature

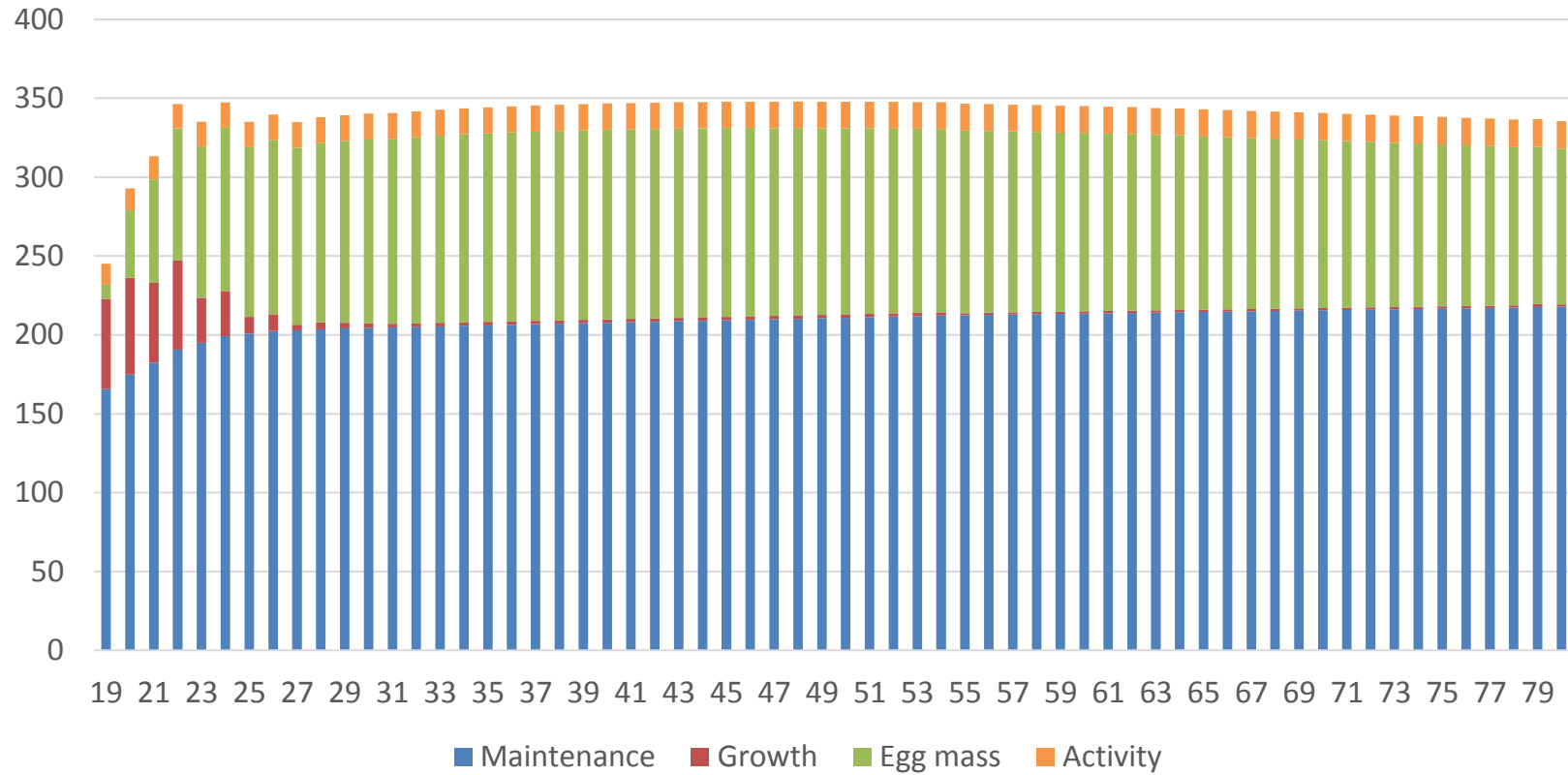


Adapted from Leeson (2012)



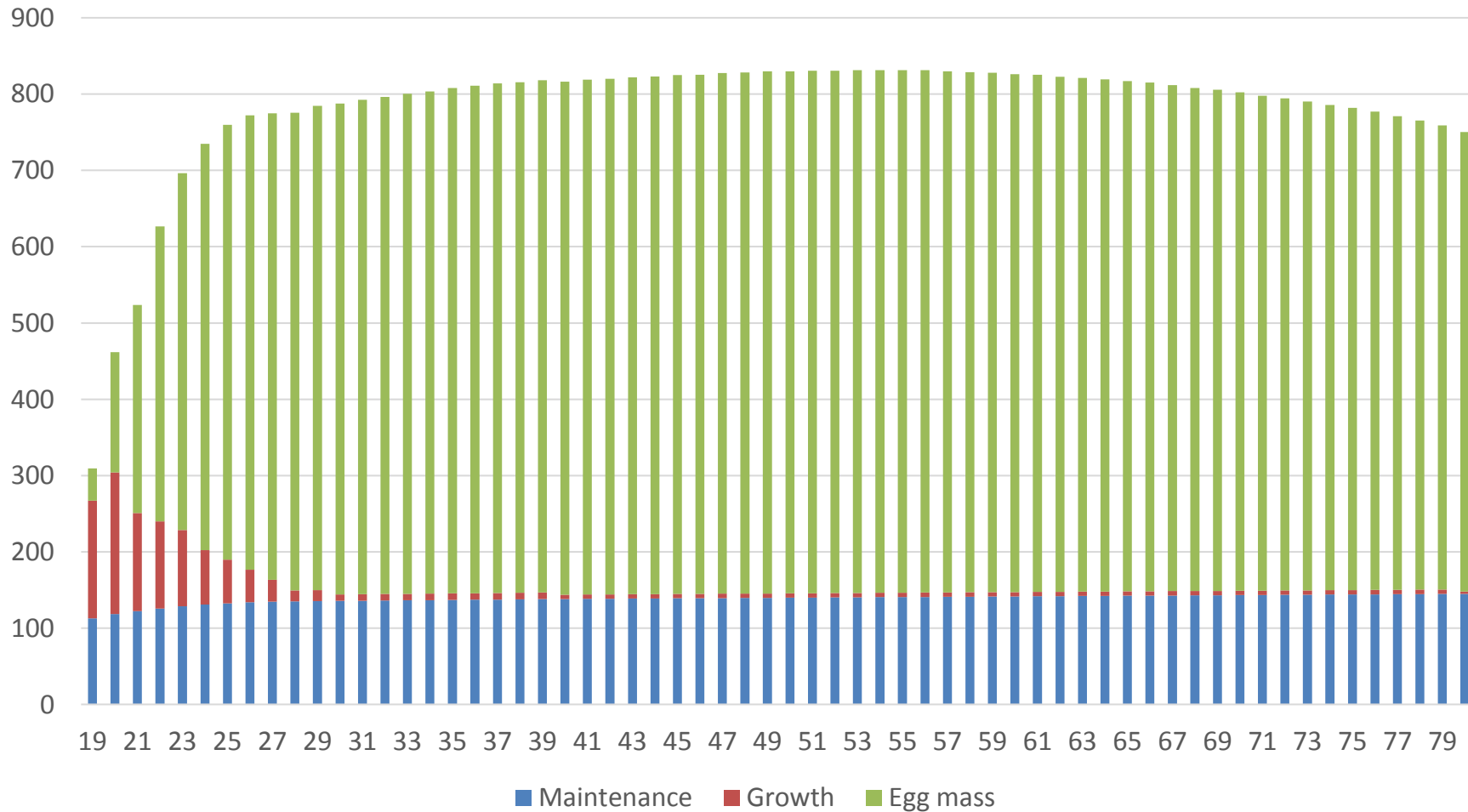
Energy needs

Energy Brown Nick



Layer amino acid needs

Mg Lys Super Nick

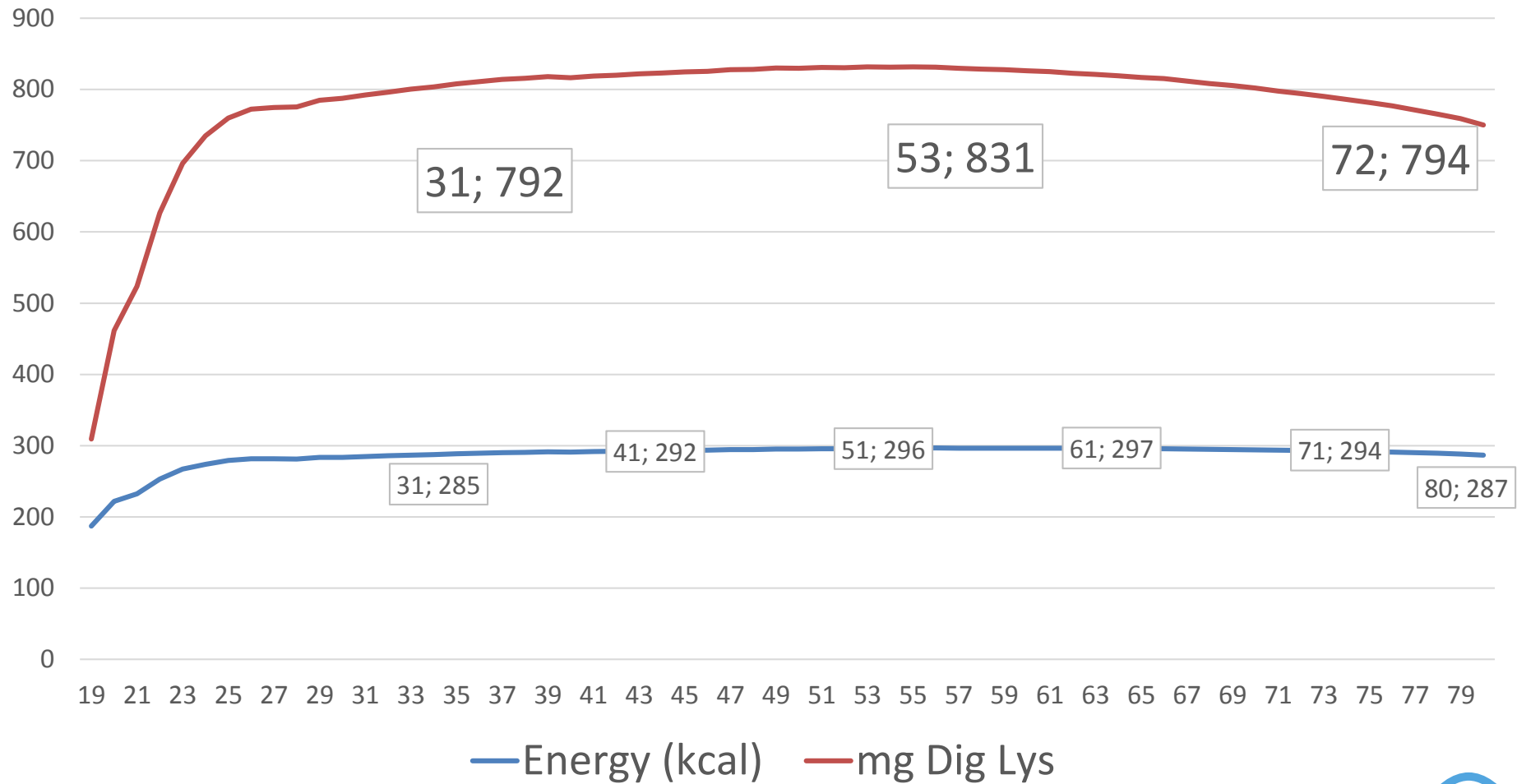


Maintenance 20% Growth 1% Egg mass 79%



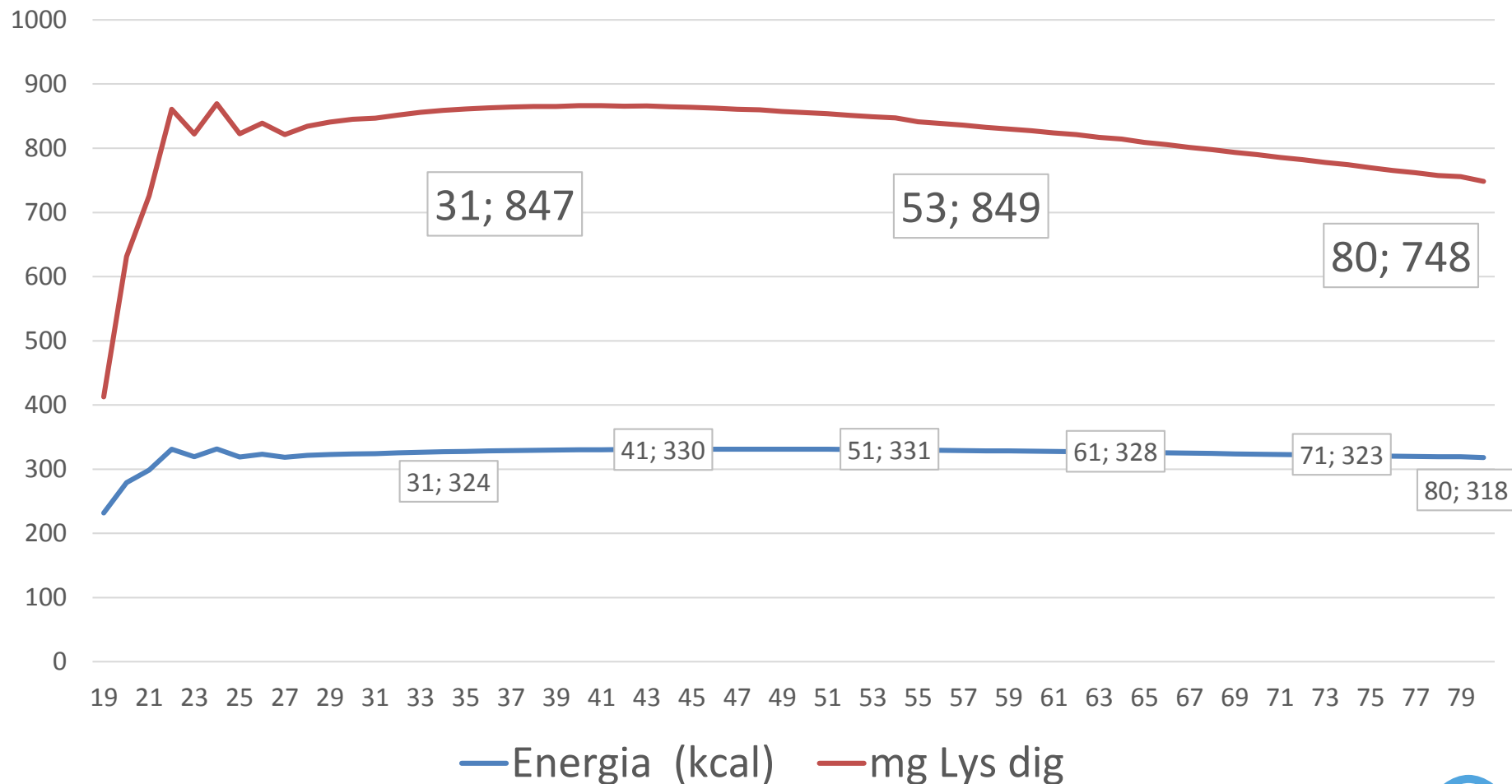
Need / day

Super Nick



Necesidades durante el ciclo

Brown Nick



Change of feed vs bird needs

Needs	Age	mg / bird / day	D Lys in feed (%)	Feed intake (gr/bird)
D Lys	31	792	0.75	106
	53	831	0.72	115

- What does it happen if feed intake doesn't increase?
 1. Drop of body weight
 2. Lost of feathers
 3. Increase of unspecific mortality
 4. Lost of production

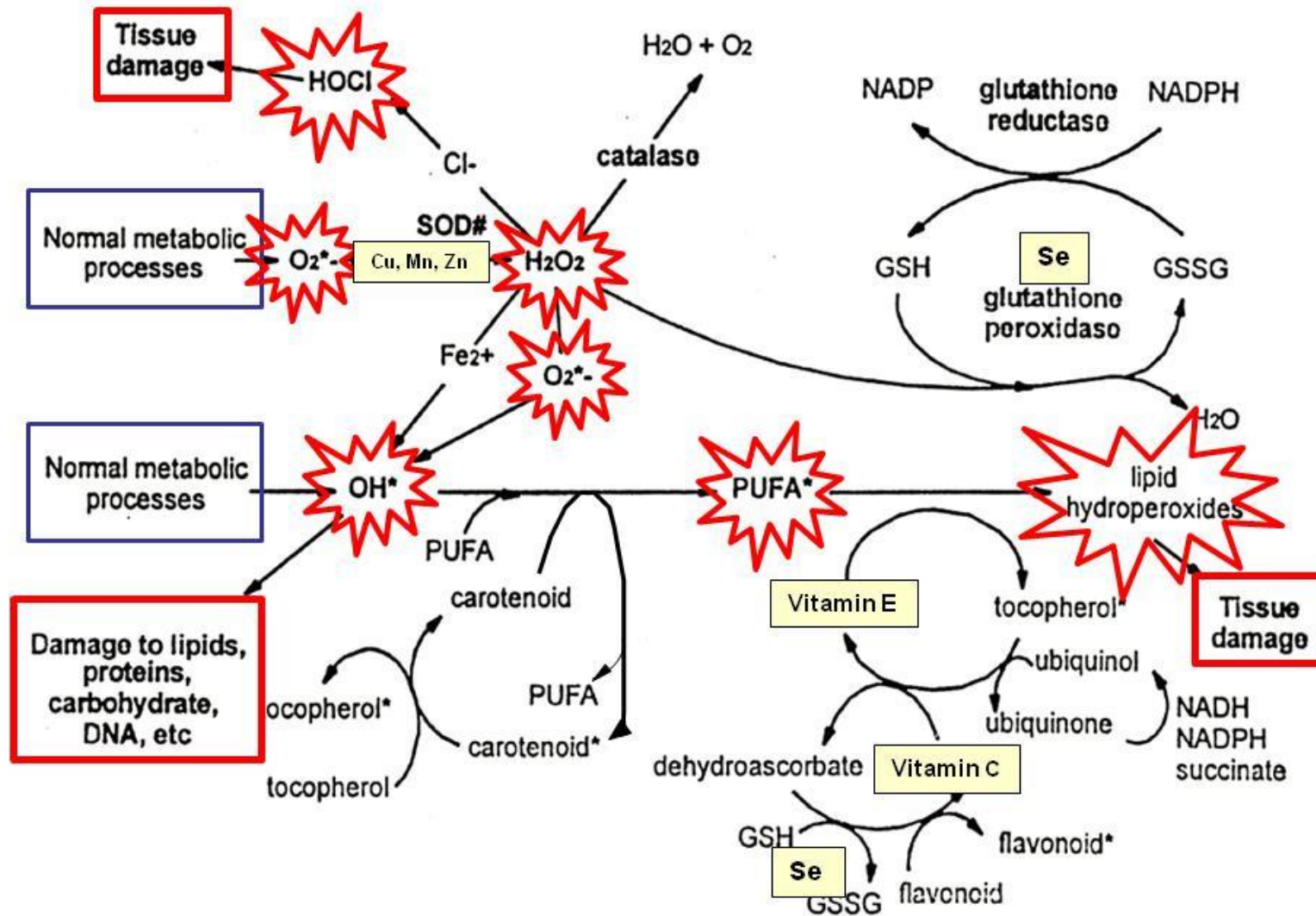
Needs of AA might needs a review

	H&N	CVB	Leeson and Summers	Fedna	Rostagno 2017
Lysine	100	100	100	100	100
Methionine	50	53	51	49	54
M+C	90	93	88	87	97
Threonine	69	66	80	70	80
Tryptophan	21	19	21	20	23
Arginine	104	-	103	110	96
Valine	88	86	89	98	93
Isoleucine	79	79	79	85	78

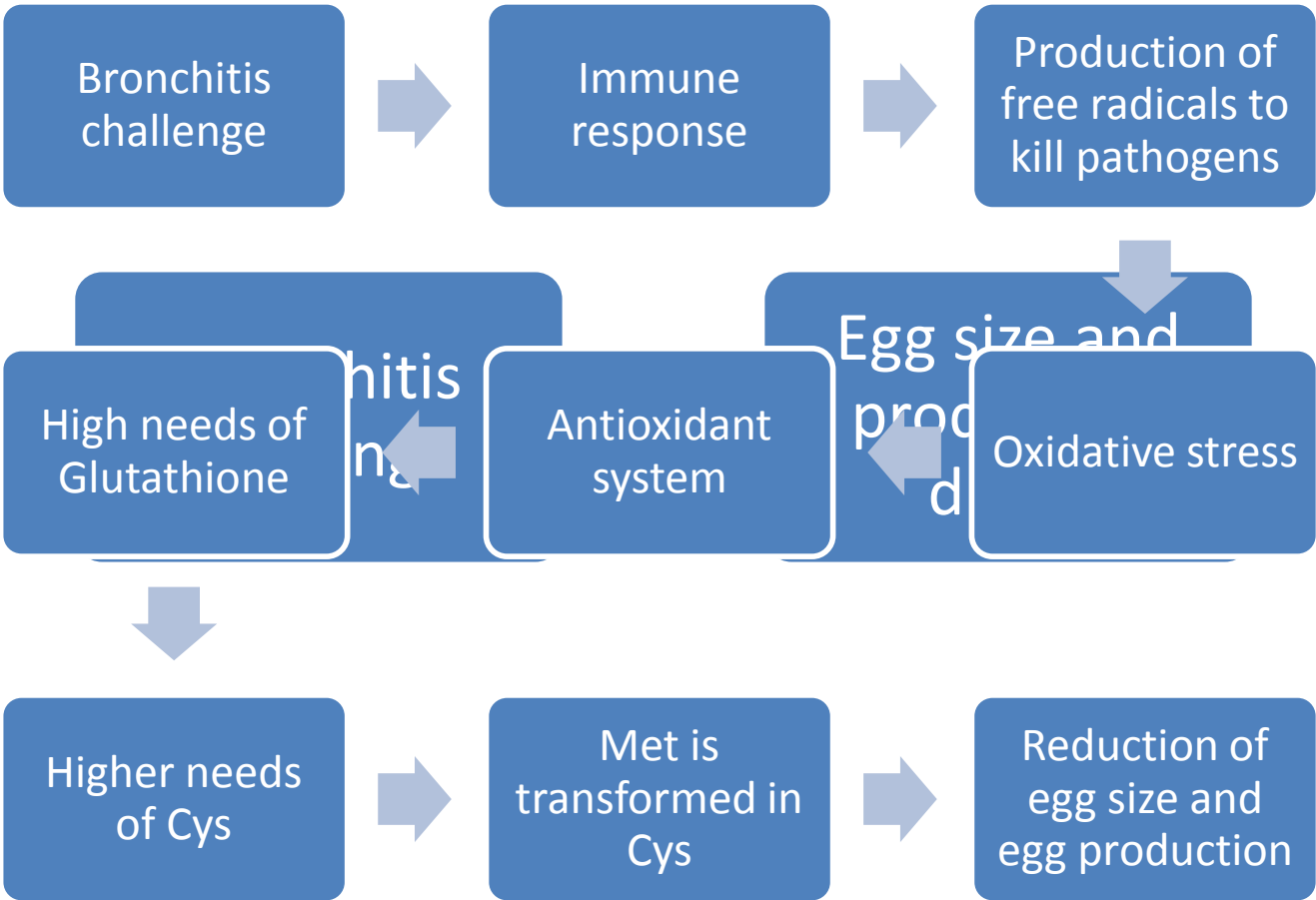
Factors of oxidative stress

- High metabolic rate
- Diseases
- Heat stress and cold temperature
- Ammonia
- Diet: unsaturated fats and mineral and vitamins deficiencies

Antioxidant system



Oxidative stress example



Tryptophane

- There is a correlation between the levels of Trp and the levels of serotonin in poultry
- Lack of serotonin is linked with aggressive behaviors
- Increasing the ratio from 18% up to 29% reduces the incidence of feather pecking (Evonik 2015)

Fiber

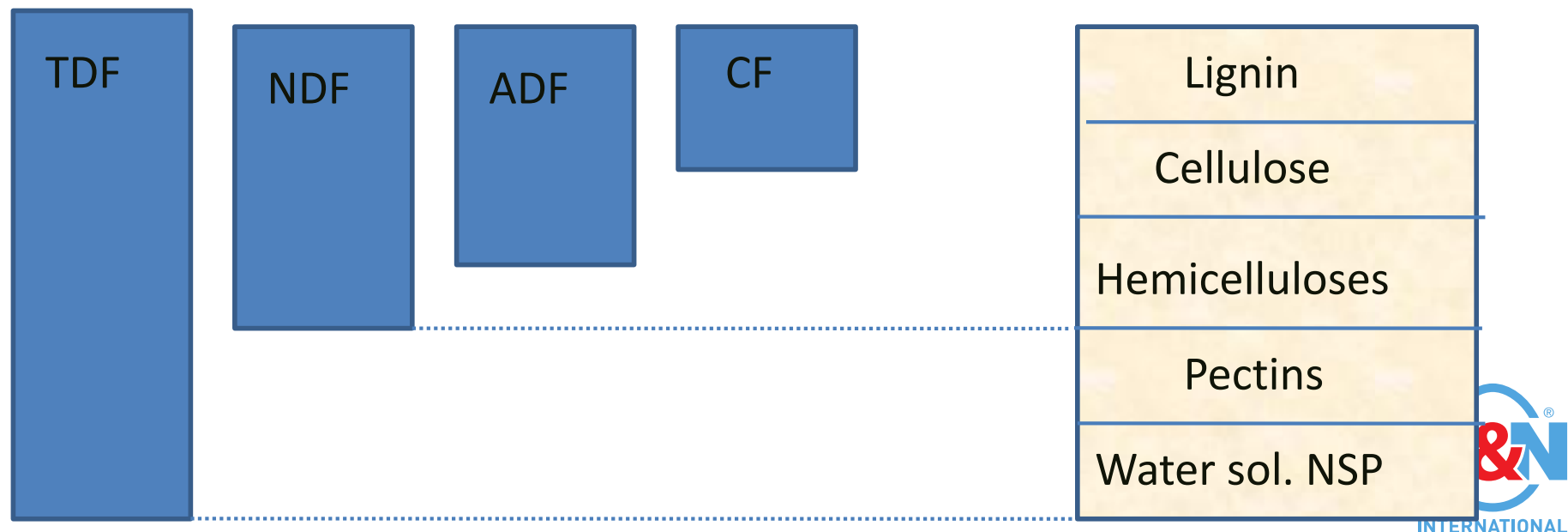
- Traditional view:
 - Reduces feed intake
 - Reduces digestibility
 - Increases viscosity and pathogens growth
- New views
 - Type, level, size and sources in the diet can show a very different results

New view of fiber

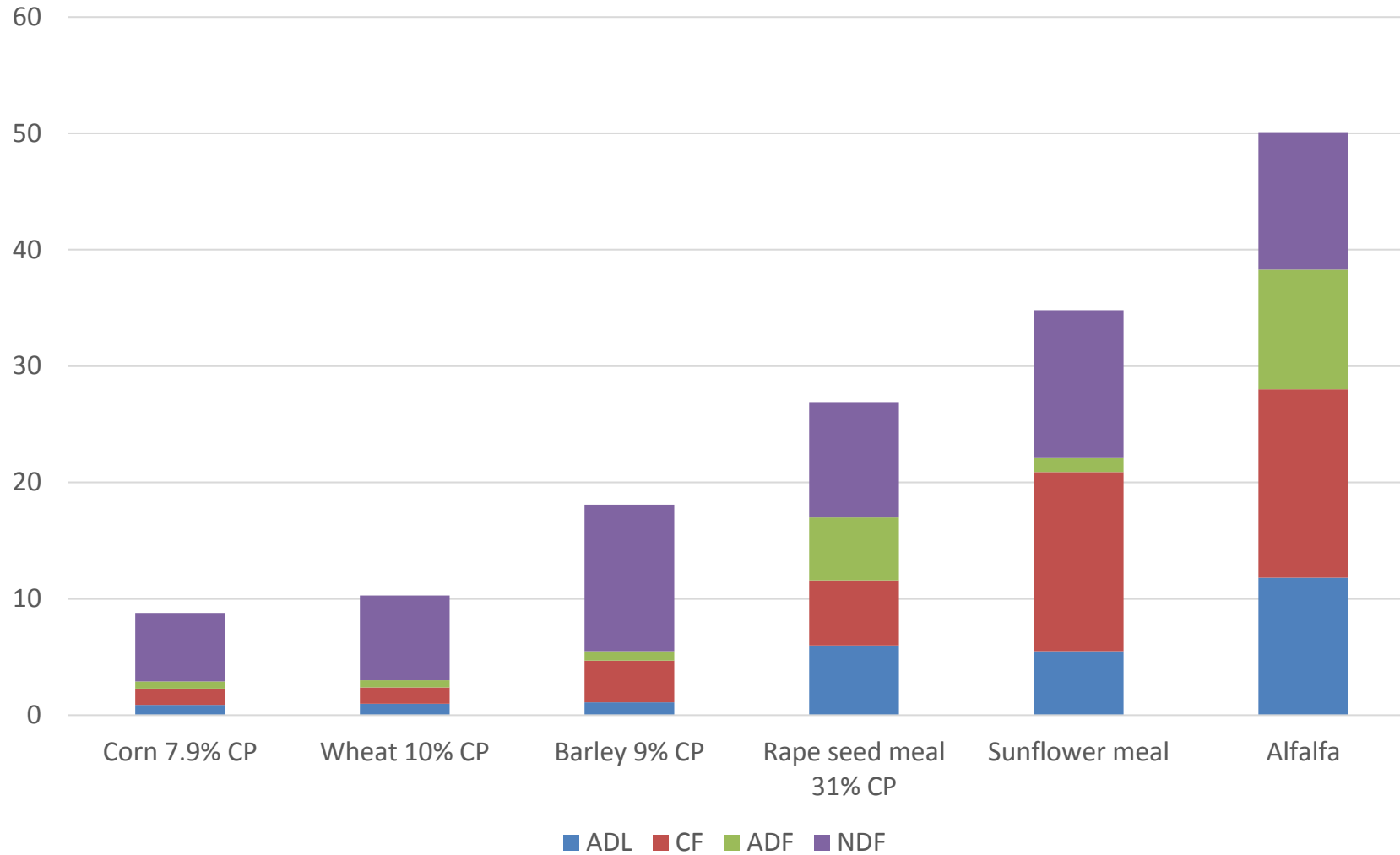
- Improves the gizzard activity
 - Increases the production of CIH, bile and enzymes
 - Increases the intensity of the reflux and improves the mixing of the digesta
- Control feed intake
 - Control of the digesta flow
 - Reduces the hyperphagia and increases the digestibility of starch
- Improves digestión of nutrients
 - Protein and minerals

What is the fiber

- Total Dietary Fiber (TDF)
 - Neutro Detergent Fiber (NDF)
 - Acid Detergent Fiber (ADF)
 - Crude fiber (CF)
 - Acid Detergent Lignine (ADL)



Fiber in the raw materials



How much fiber is needed?

- Layers aren't really fiber deficient
- The fiber is a solution to a nutritional deficiency
- Is it easier to increase the fiber than finding the deficiency?

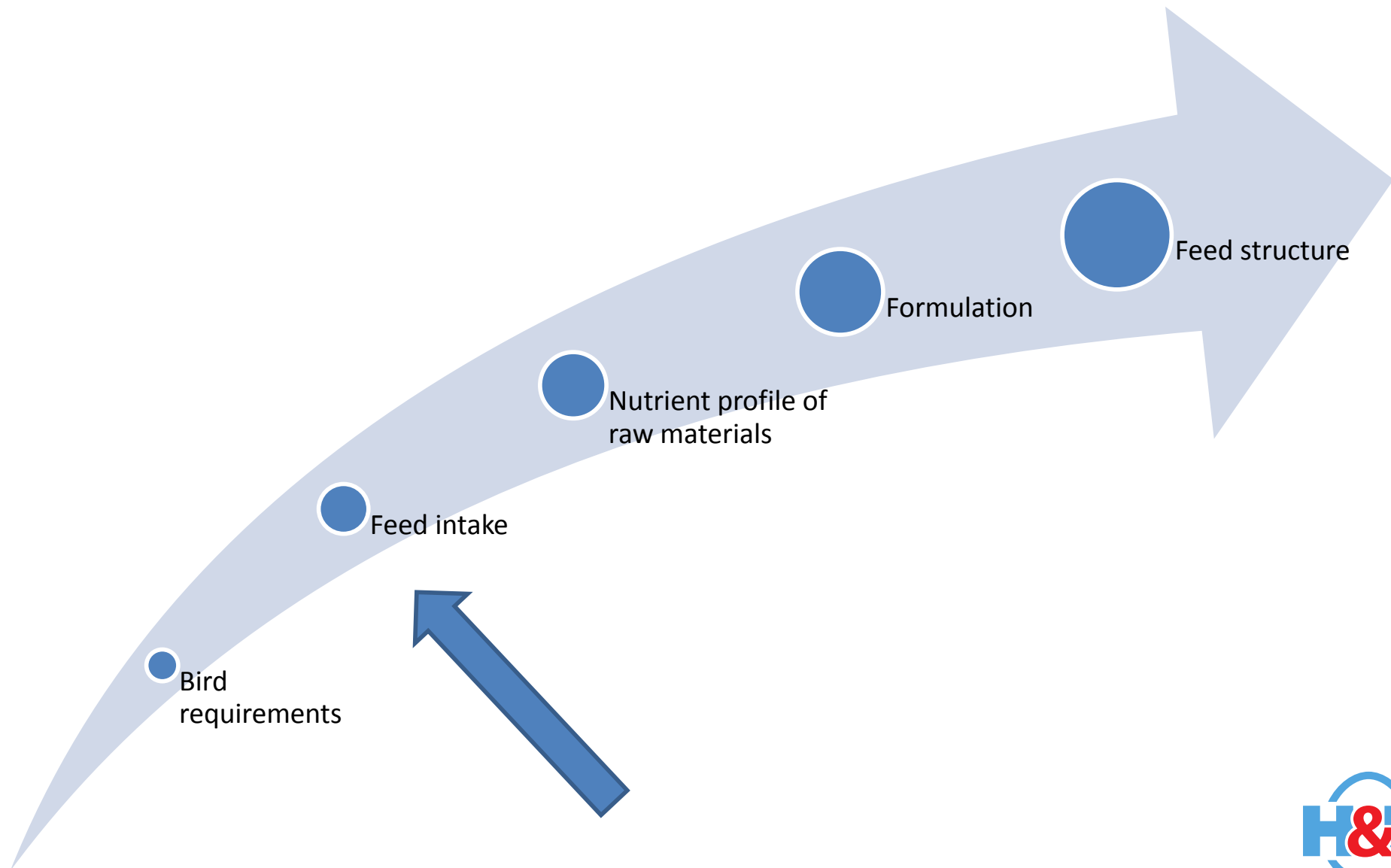
Sodium

- Factors of feather pecking
- Levels of 0.17-0.18 % Na
- Keep the balance with the others Cl, K (and S)

Is really the sodium?

- How much is the mixing time?
 - How much is the CV of the mixer?
 - What was the last time the mixing CV was tested?
- Are the birds eating the all the fines?

5 steps in feeding

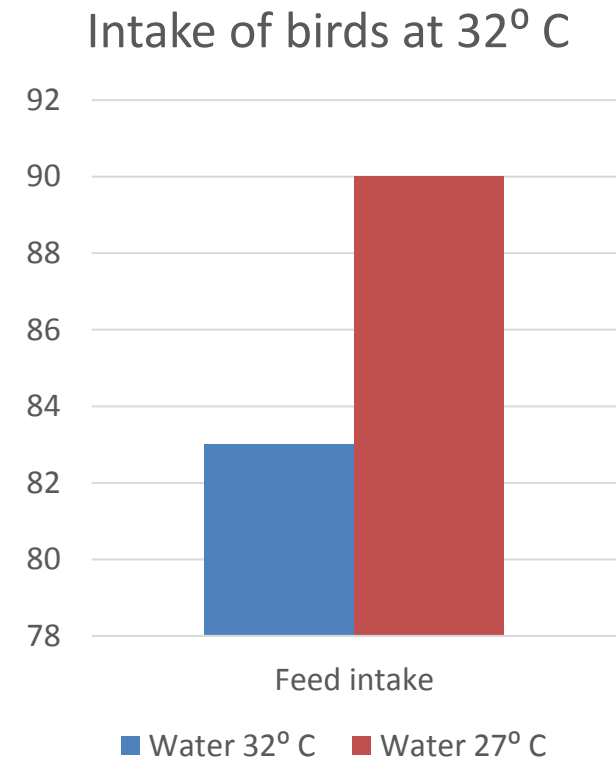
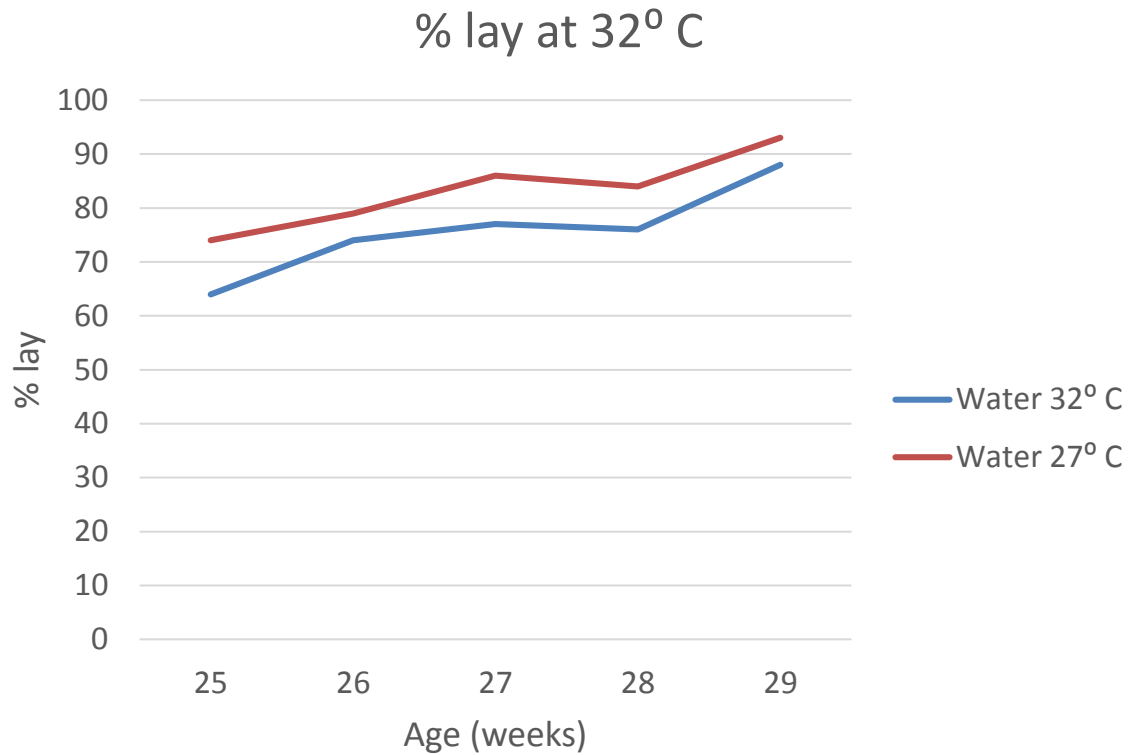


European trend

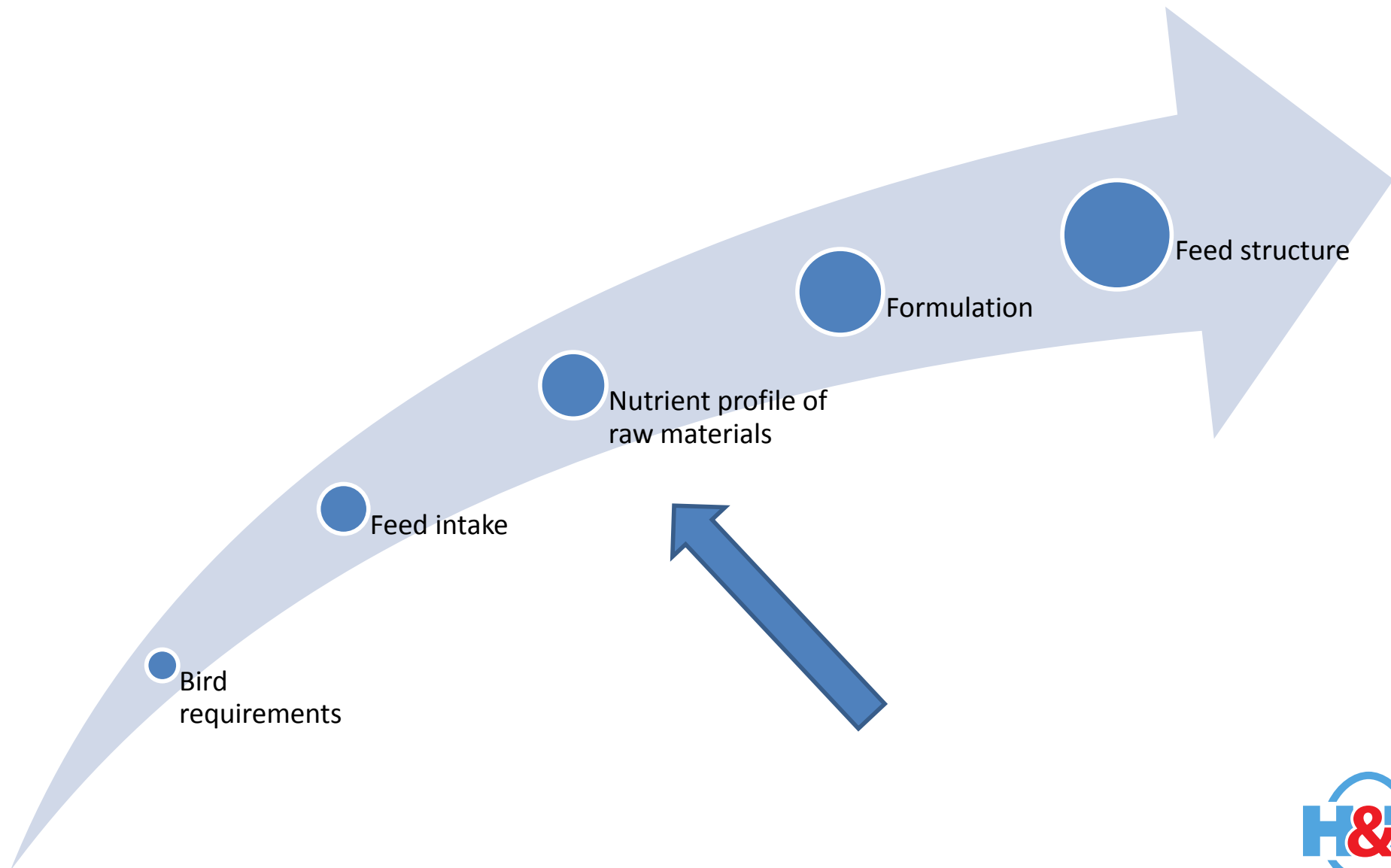
	hen / day	Intake		
		115	120	125
MEn	329	2,861	2,742	2,632
Lys Dig	830	0.722	0.692	0.664
Met Dig	415	0.361	0.346	0.332
M+C Dig	747	0.650	0.623	0.598
Thr Dig	581	0.505	0.484	0.465
Trp Dig	183	0.159	0.152	0.146
Arg Dig	865	0.752	0.720	0.692
Val Dig	726	0.632	0.605	0.581
Ile Dig	664	0.577	0.553	0.531



No water no feed



5 steps in feeding



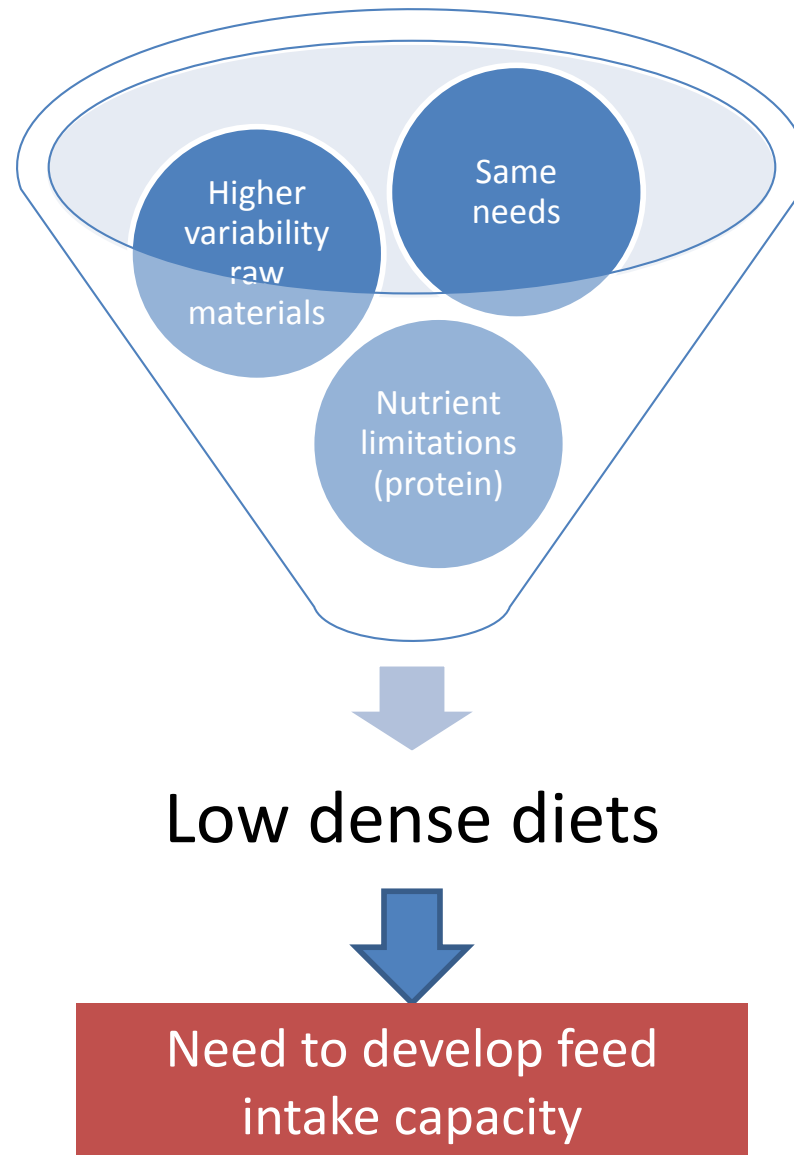
Ecological raw materials

- Raw material challenge
 - Non GMO
 - Variability of the composition
 - Other contaminations?
- Additives challenges:
 - Synthetic amino acids
 - Vitamins restrictions
 - Coccidiostats not allowed
- Different legislations

Ecological raw materials

- Additives can be used:
 - Enzymes that aren't GMO
 - Antioxidants: naturales like tocopherols
 - Preservatives: sorbic and citric acid

Find the strategy



Example of a diet

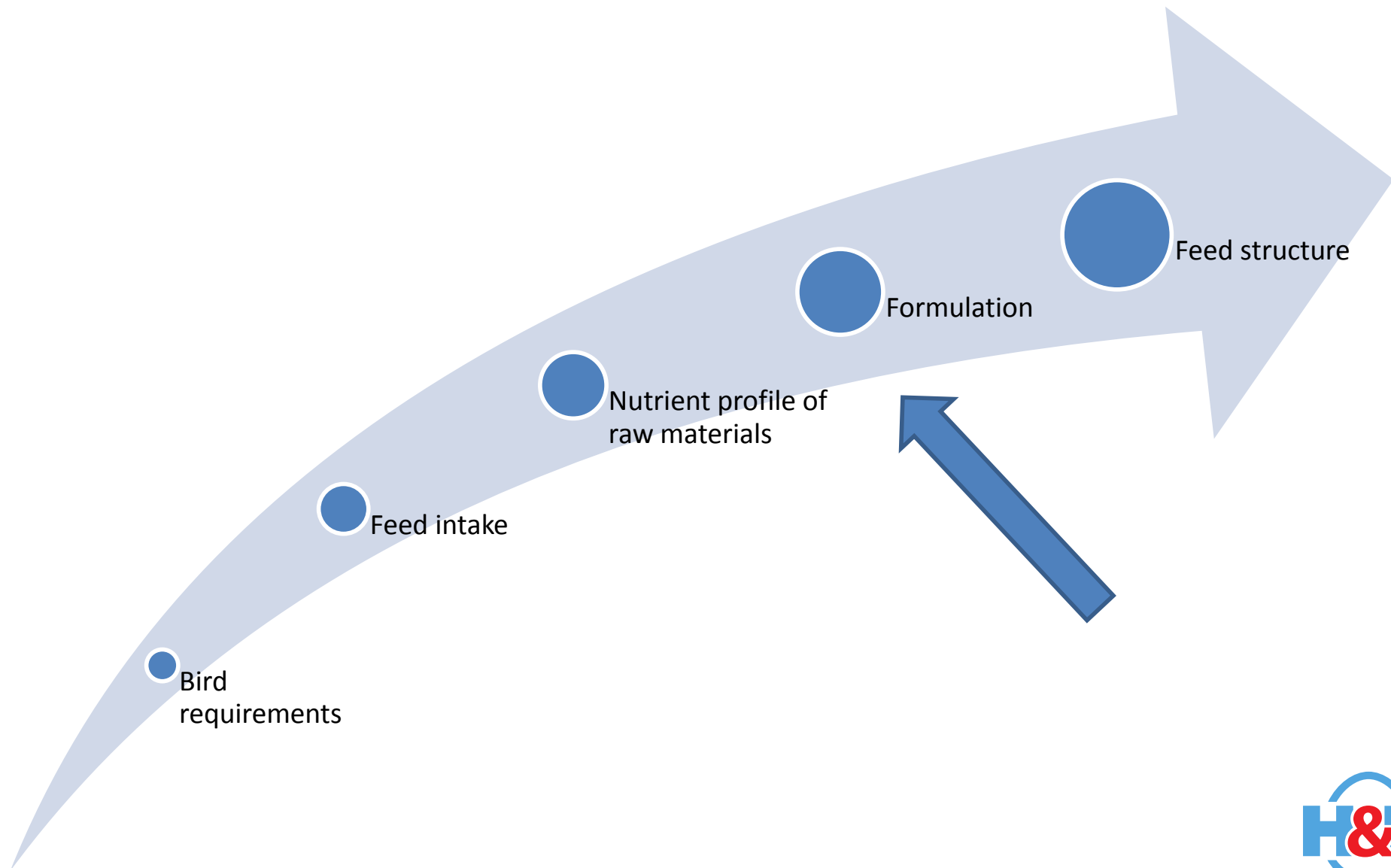
	%
Crude protein	16.20
Crude fiber	6.40
Crude fat	5.5
Lys total	0.75
Met total	0.32
Energy	2.555*
Calcium	3.90
Phosphorus	0.62
Sodium	0.16

	%
Wheat	27.05
Sunflower meal	6.40
Triticale	11
Peas	10
Corn	10
Calcium carbonate	9.5
Beans	5
Corn gluten	4.25
Monocalcium P	1.30
Soya oil	0.15
Salt	0.15

*Similar to 2650 kcal ME others



5 steps in feeding



Added fat effect

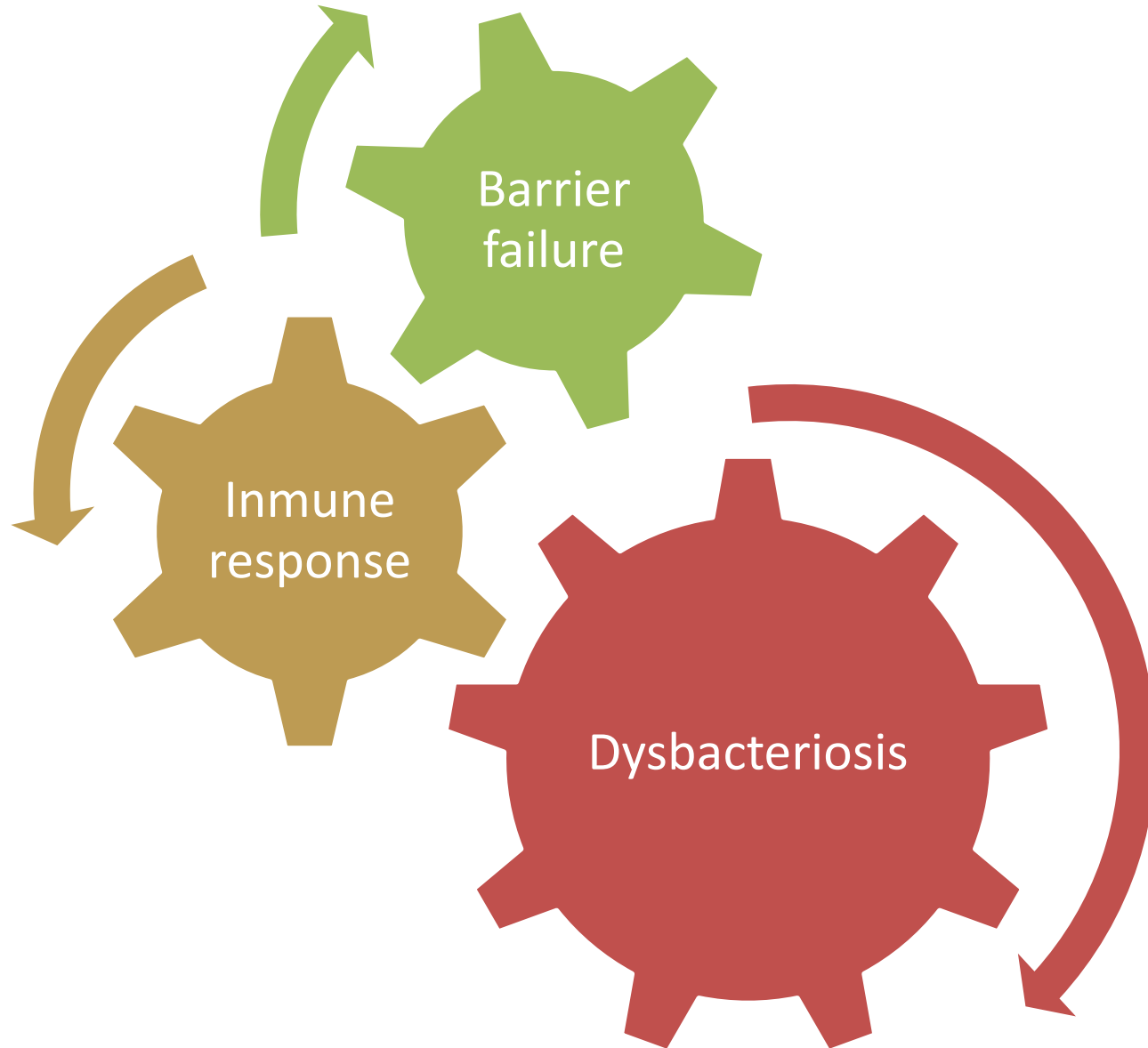
Fat inclusion	1.1	3.0	SEM
ADFI (g)	117	118	0.83
Egg prod. (%)	77.0 ^b	79.3 ^a	0.84
FCR (kg/kg)	2.36 ^a	2.26 ^b	0.020
Egg weight (g)	64.9 ^b	66.3 ^a	0.28

n = 24; P < 0,05

Oxidative stress

- Vitamine E: 15-30 IU
- Vitamine A: 10000 IU
- Antioxidants
- Minerals
 - Inorganic
 - Organic

Gut health challenge



Dysbacteriosis

- Change of the flora of the gut that usually doesn't grow in that area
- Related to:
 - Feed contamination
 - Reduction of the digestibility:
 - Low digestible raw materials, carbohydrates or protein
 - There will be an increase of nutrients for growth
 - There will be an increase of the fermentation in the ileum
 - Disbalanced Na+K-Cl-S

Feed quality

	Max E.coli (log CFU)	Max. Clostridium (log CFU)	Average Salmonella (%)
Soya meal	2.08	3.69	9%
Brans	2.48	3.48	13%
Rapeseed meal	2.30	2.15	12%
MBM	-	-	15%

	Enterobacteria (log CFU)
Wheat	3.5
Corn	2.48

Antinutritional factors

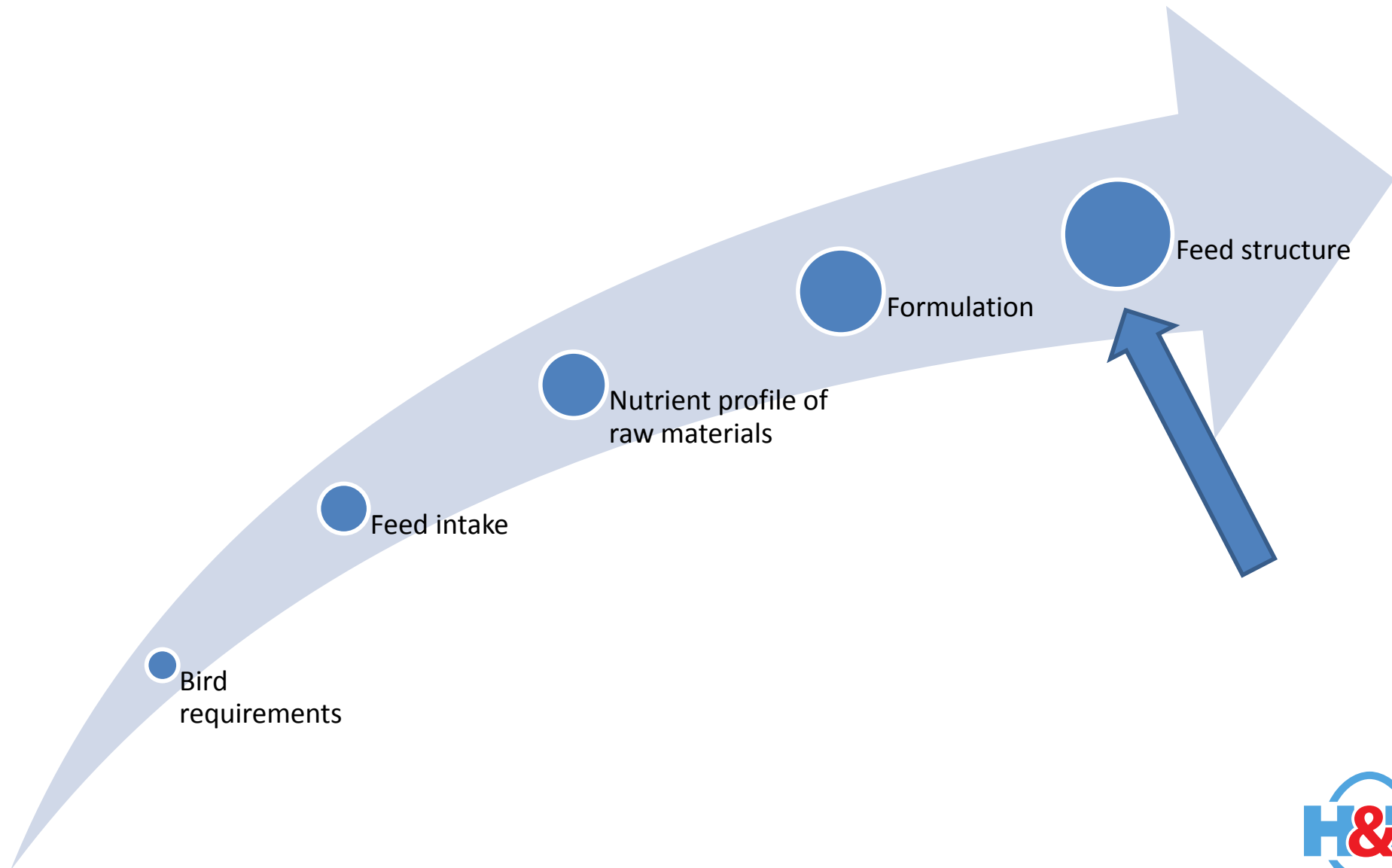
Plants

- Phytic acid
- NSP
- Trypsin inhibitors
- Glycinin and β -conglycinin
- Tanins
- Glucosinolates

Processed

- Maillard reactions
- Oxidation

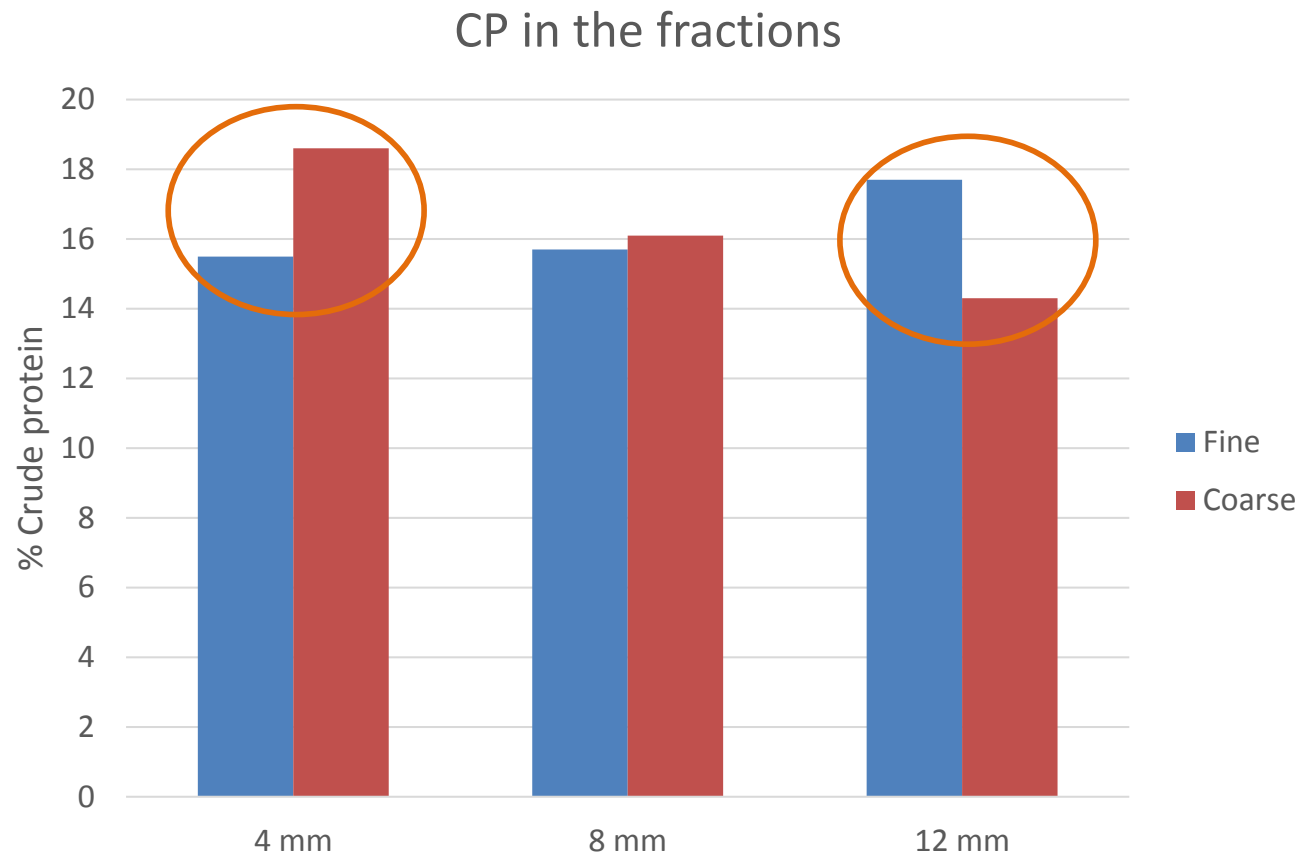
5 steps in feeding



Uniformity



Composition of feed

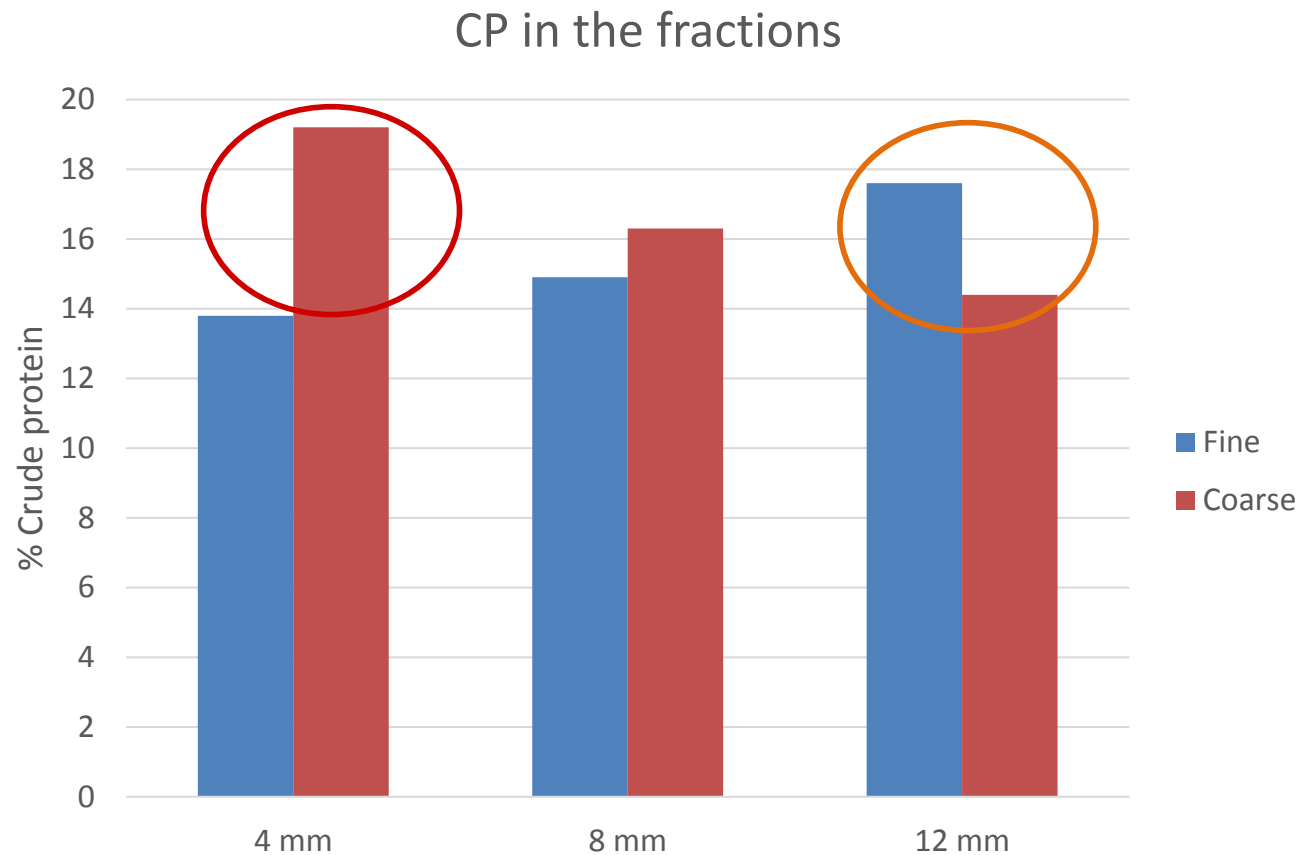


Corn diet

Adapted from Herrera et al
Poultry Science 97, 2018



Composition of feed



Barley diet

Adapted from Herrera et al
Poultry Science 97, 2018



Controls

Pullets	Average %
> 2 mm	28.28
> 1.4 < 2mm	24.55
> 1 < 1.4 mm	12.82
> 0.71 < 1 mm	9.9
> 0.5 < 0.71	8.8
< 0.5	15.66

Layer	Average %
> 2 mm	26.26
> 1.4 < 2mm	30.3
> 1 < 1.4 mm	14.49
> 0.71 < 1 mm	9.09
> 0.5 < 0.71	7.13
< 0.5	12.69

Summary

- The needs change because there are new challenges
- Get the right feed intake should be a target
- Feed milling becomes a big part of the success of the feed