How to feed layers in alternative production systems

Paulien Rutten, MSc.

Nutritionist Hendrix Genetics Layers

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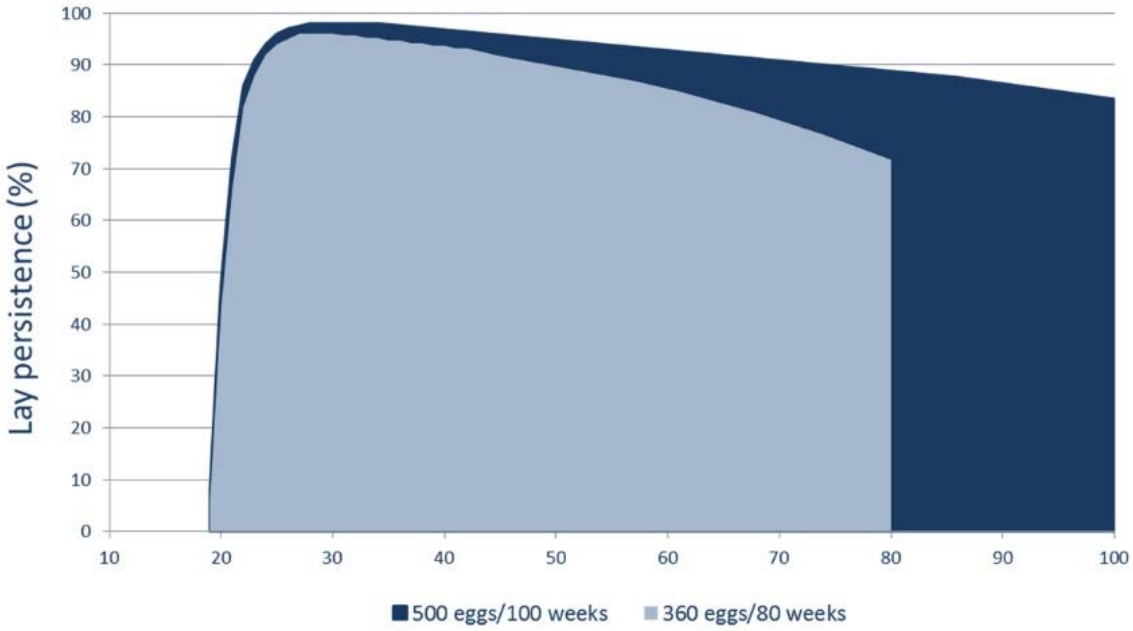
Introduction

- Paulien Rutten
- Master of Science in Animal Nutrition and Marketing
- Hendrix Genetics, Business Unit Layers
- Technical support on nutrition in global technical team
- For Hendrix Genetics well-known brands

Trend towards longer production cycles - also in alternative production systems -



- Thanks to breeding program big improvement in egg production and egg quality late cycle
- Egg producers keep the birds longer
- Birds are still selected for better persistency and improvement will continue for the future

Presentation outline

1. Energy requirements
2. Amino Acid requirements
3. Feed particle size
4. Empty Feeder Technique
5. Fiber

1. Energy requirement

for

Robust birds

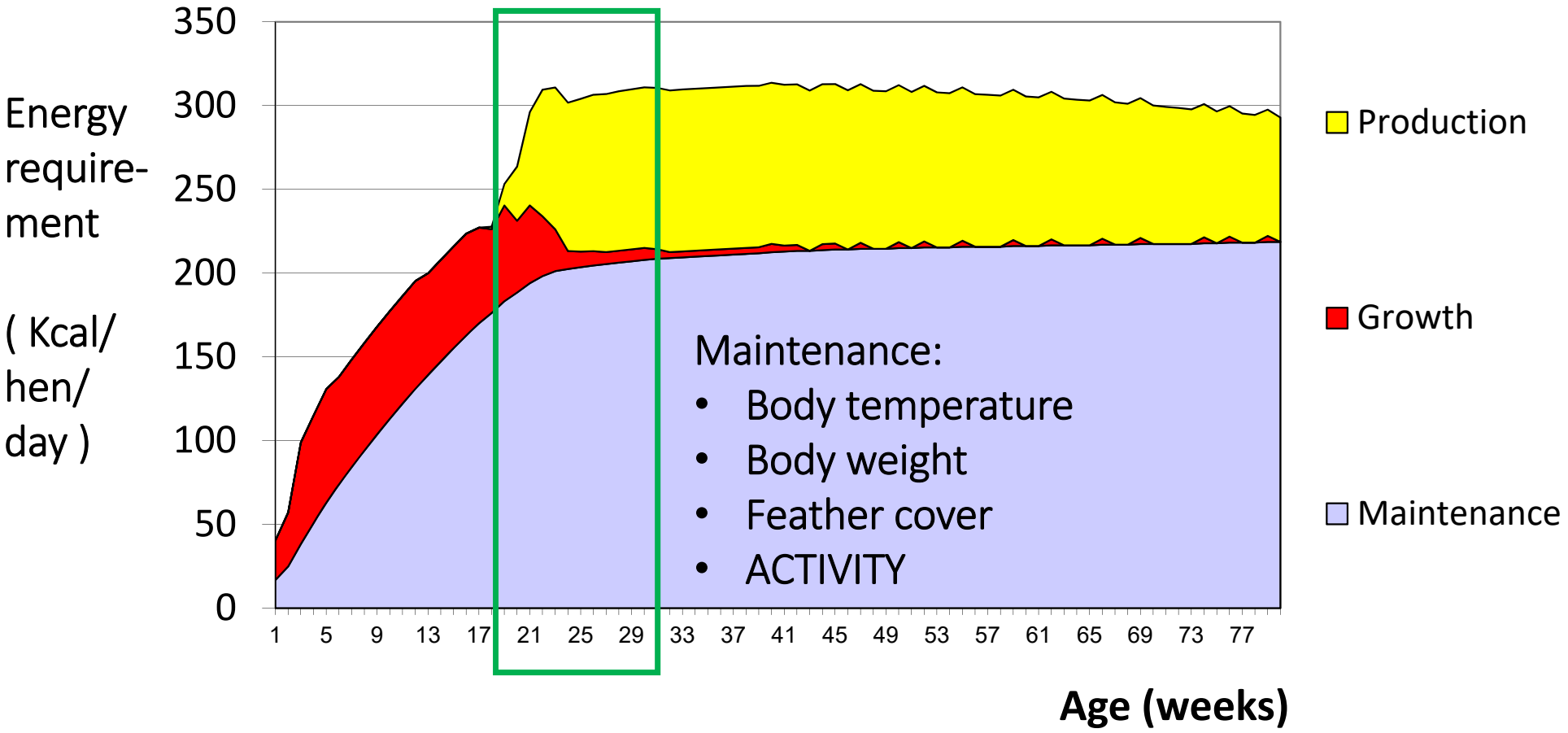
with

Mature body weight

at

Start of lay

Allocation of energy and energy requirement



Comparison different housing systems

	Production	Activity	Temperature variation
Cage	+++	+	+
Barn and indoor	+++	++	+
Barn and free range	+++	++	+++
Aviary and indoor	+++	+++	+
Aviary and free range	+++	+++	+++
Impact on ENERGY requirement	**All HIGH**	**Aviary HIGH**	**Free range HIGH**

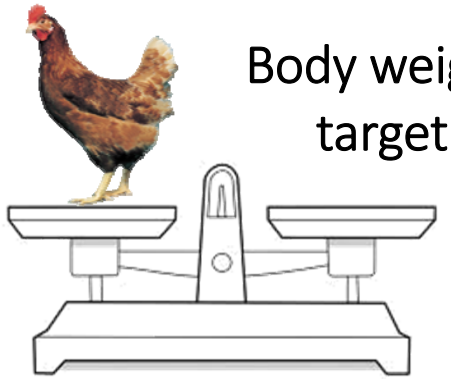
Consequences of low energy diet

Especially a risk in Aviary systems and free range (outdoors)

- **Body weight** will decrease resulting in underweight layers
- **Feed intake** will increase to compensate for low energy density
- **Manure quality** will deteriorate if birds overconsume crude protein
- **Liver health** will become a risk if crude protein is used as energy source

- **Egg production** will be lower and less persistent

Energy balance & body weight management



Body weight target

MAINTENANCE
PRODUCTION
GROWTH

BODY WEIGHT
FEATHER COVER
BODY TEMPERATURE
ACTIVITY

ENERGY REQUIREMENT

ENERGY CONSUMPTION

Energy feed concentration

Feed intake

Feed presentation

Feed distribution management

Start of lay:
increase body weight according to breed standard

Mid & Late lay:
target stable body weight

Advices on energy

Body weight monitoring!

Start of lay

- Target : reach mature body weight quickly
- Feed with higher energy level (2850-2900 Kcal/kg)

Middle and end of lay

- Target : maintain a stable body weight
- Birds too fat, risk for fatty liver. Birds too light, weak birds.
- Feed with lower energy level (towards 2700 Kcal/kg)

2. Amino acid requirement

depends on

Egg Mass production level

Amino Acid requirements and Egg Mass

Birds in cage and alternative systems have

same performance in terms of daily Egg Mass (EM)

=

NO difference in amino acid requirements between systems!

Amino acid requirements and Egg Mass

Limiting amino acids	**Ideal Protein ***	**Requirements *** in mg per gram Egg Mass		**Daily Requirements *** in mg per day Example for 59,5 g Egg Mass	
		Dig. AA	**Total AA**	**Dig. AA**	**Total AA**
LYS	100	13,50	15,25	810	900
MET	54	7,2	7,6	430	455
MET + CYS	85	11,45	13,0	690	770
TRY	22	3,00	3,5	180	208
ILE	83	11,5	13,0	690	775
VAL	93	12,6	14,2	760	840
THR	70	9,4	11,0	565	655

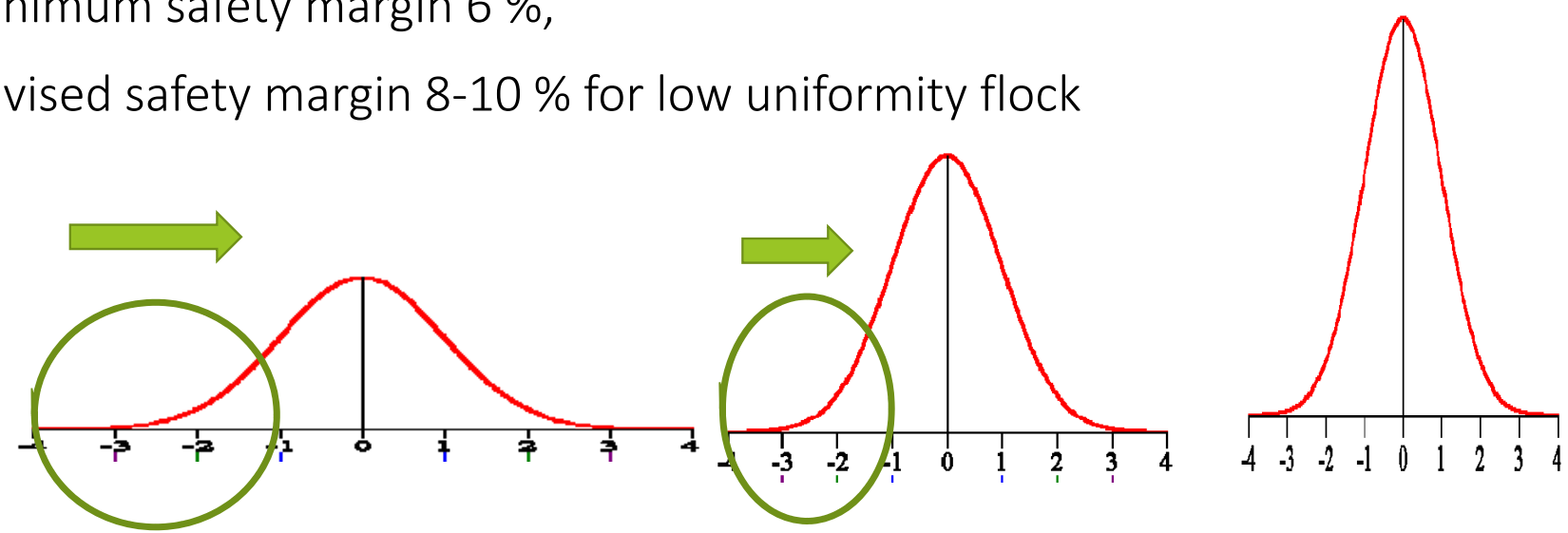
* *Based on NRC 1994*

Managing a population not a bird

- Cage free flocks are usually less even than flocks housed in cage systems
- Challenges are to feed and manage the weakest birds and to keep the flock even
- Use a **safety margin for amino acids**, especially at start of lay:

  Minimum safety margin 6 %,

  Advised safety margin 8-10 % for low uniformity flock



Advices on amino acids

Start of lay

- Higher requirement for growth and, in alternative systems, lower flock uniformity: use **safety margin** of minimum 6 %; advised 8-10 %
- Amino acids levels to be adjusted to egg production (daily Egg Mass) and **Feed intake** observed: still limited feed intake capacity at start of lay, therefore increase amino acid % in feed

Middle and end of lay

- Lower requirement due to finished growing period
- If feed intake is stable and production is high, don´t decrease the amino acid concentration to **secure laying persistency**
- Alternative systems often higher **feed intake**, therefore lower amino acid % in feed compared to cage housed birds

3. Feed Particle size

and

4. Empty Feeder Technique

for

uniform flock

Feed Particle size

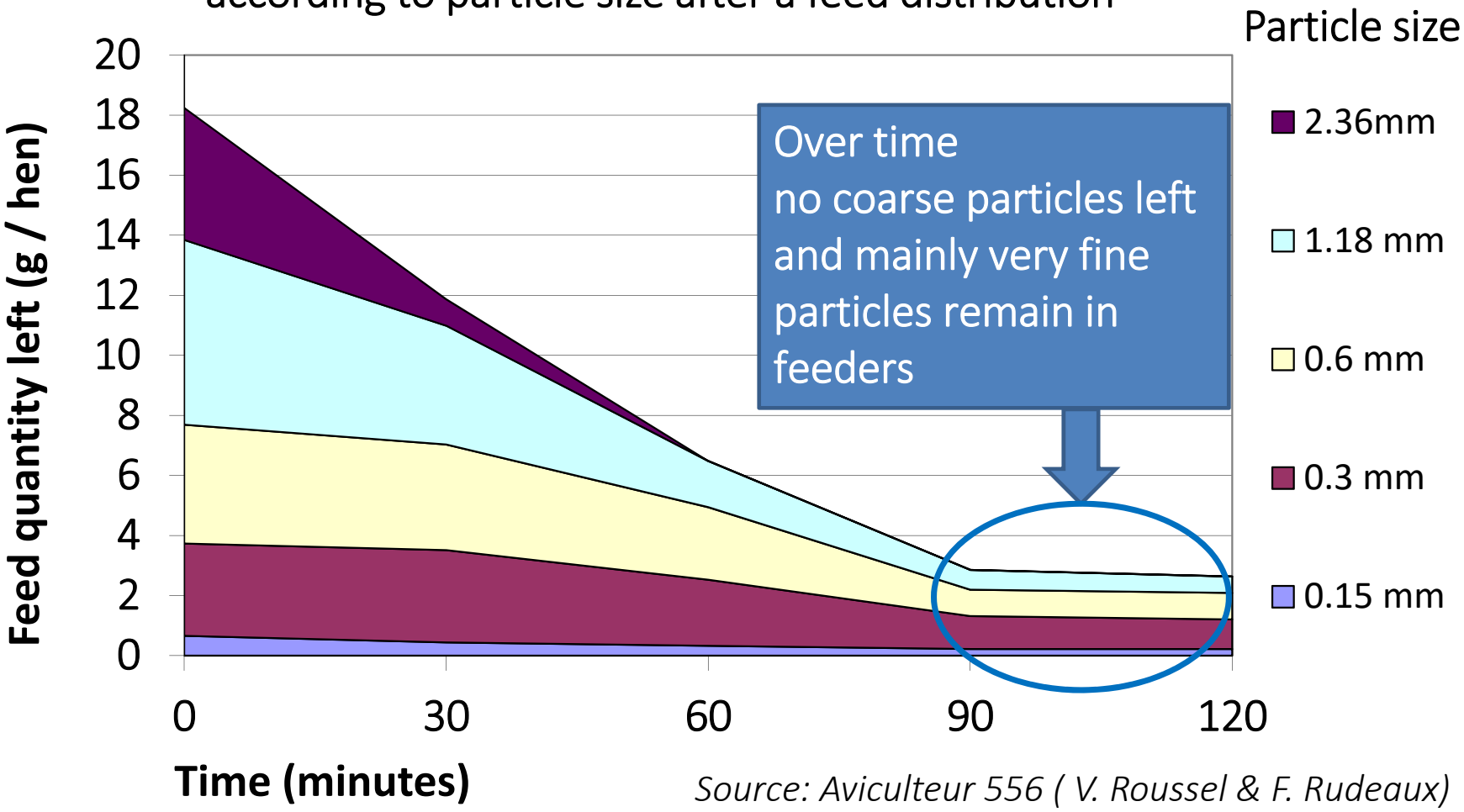
Coarse particles

- Digestive tract better function when coarsely ground feed ingredients are used
- Note: feed particles should be uniform in size to avoid selective eating

Recommended particle size	Consequences of deviations
min. 75 – 80 % between 0,5 and 3,2 mm max. 15 % < 0,5 mm max. 10 % > 3,2 mm	Too fine feed: under consumption, risk for nutrient deficiency Too coarse feed: feed not uniform, selective eating

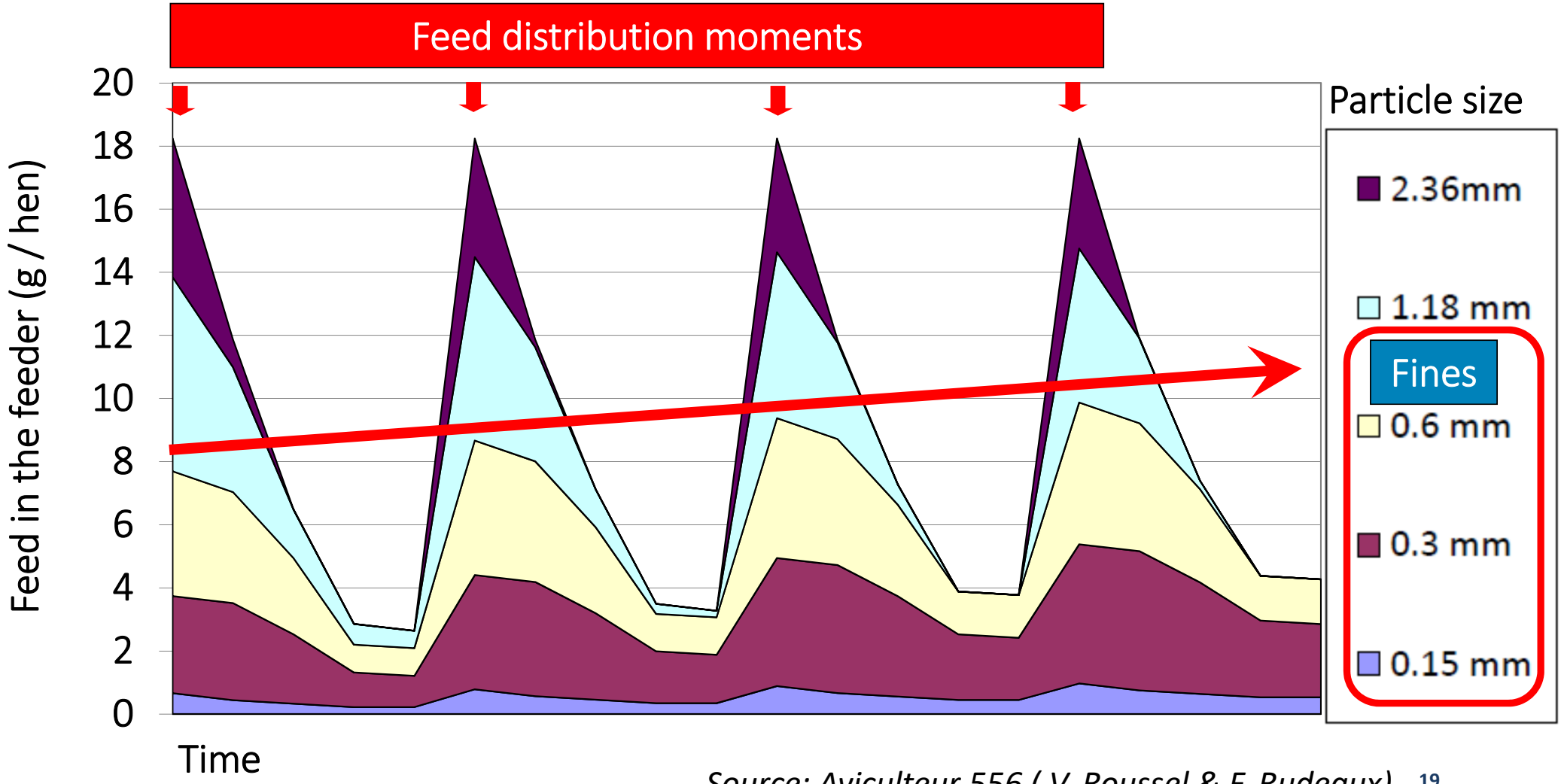
Feed particle size

Evolution of feed quantity left in the feeder (g / hen)
according to particle size after a feed distribution



Source: Aviculteur 556 (V. Roussel & F. Rudeaux)

Accumulation of fine particles in feeders



Source: Aviculteur 556 (V. Roussel & F. Rudeaux)

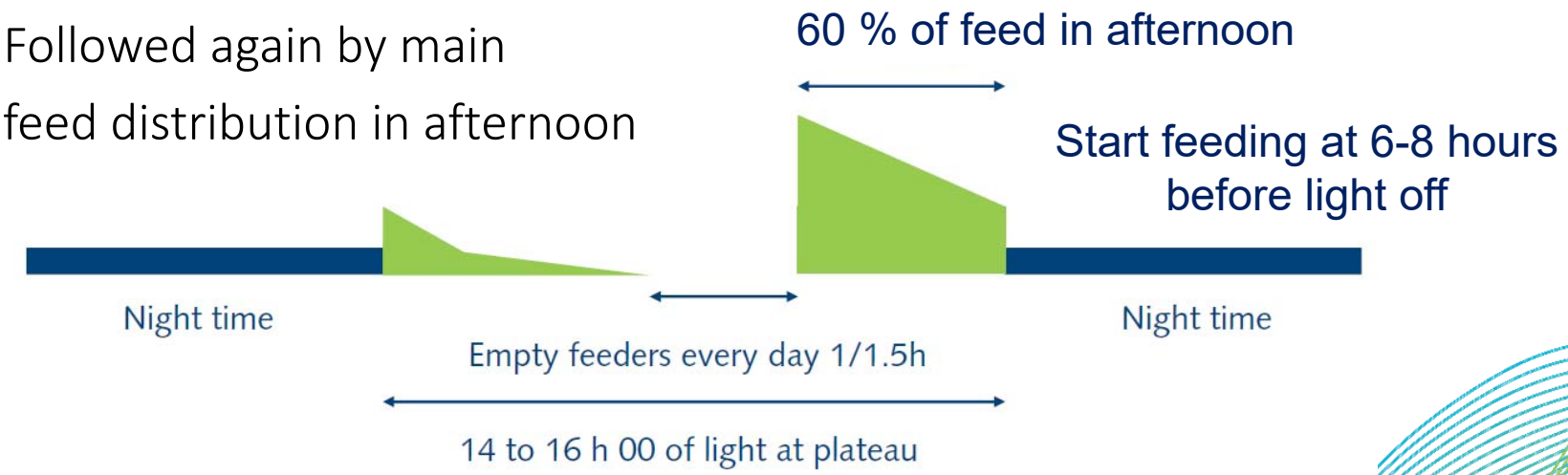
Empty Feeder Technique

Objective

Make sure birds eat all required nutrients daily and calcium available during calcification

Method

- Main feed distribution 6-8 hours before light off
- Finish feed in the morning including small particles (vitamins, minerals)
- Empty feeders in the middle of the day
- Followed again by main feed distribution in afternoon



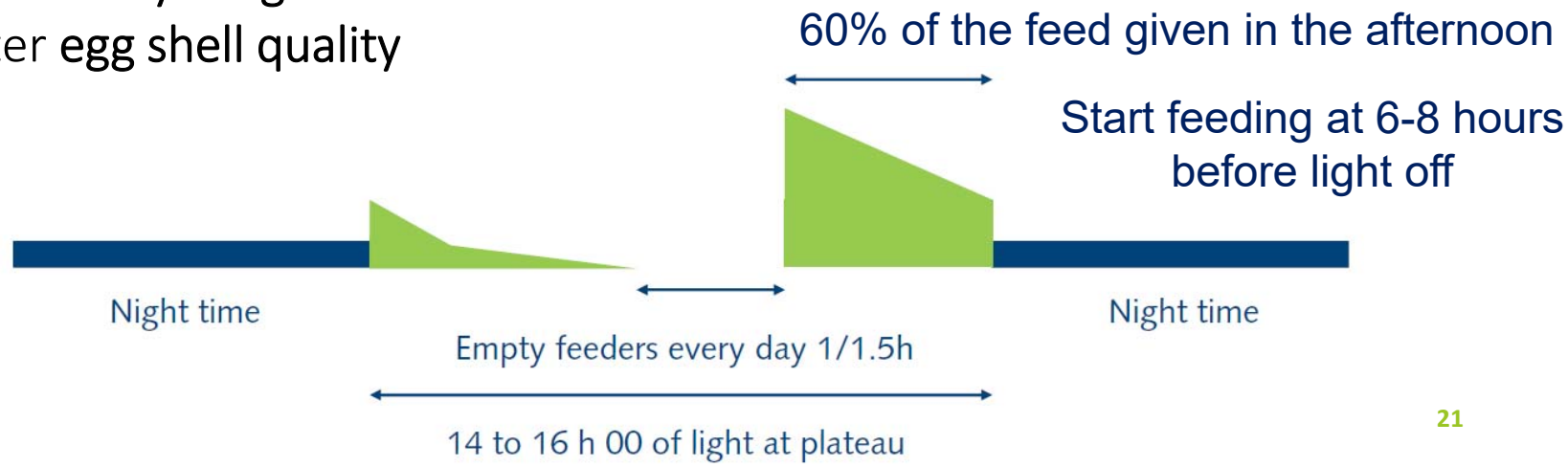
Empty Feeder Technique

Effect

- Less selective eating
- Eat daily ration
- Lower risk for nutrient deficiencies

Result

- More **uniform** flock
- Higher **body weight**
- Better **egg shell quality**



5. Fibre

for

Feather cover,

Livability and

Feed intake capacity development

Fibre

Feather cover

- Fiber helps to maintain good feather cover: poor feather cover gives high energy requirements due to higher requirements for maintaining body temperature. Higher feed intake needed to meet energy requirements.

Livability

- Fiber helps to manage body weight, contributes to good liver health and gives more quiet birds that are less likely to develop pecking behavior.

Feed intake capacity development

- Fiber helps to develop capacity of upper gastrointestinal tract, necessary for good start of lay and very helpful in alternative systems where requirements for energy are higher

Just any type of fiber?

- **NO**…. Specific fibres needed for layers!

1. Type of fibre **insoluble**
2. Structure **coarse**
3. Level recommendation depends on age and situation

Insoluble fibre

- Not digestible by enzymes
- Sometimes fibers fermentable by intestinal bacteria
- Fermentable fibres are soluble fibres, like pectin
- Insoluble fibres: NOT digestible and NOT fermentable by poultry
- Insoluble fibres: structural material for the gastrointestinal tract
- Structural material: healthy for the layer!
  - improves digestion by stimulating gut movements
  - stimulates development of crop and gizzard in rearing phase
- Lignin is insoluble fiber
- Example high insoluble fiber ingredients: oat hulls, sunflower meal

Coarse fiber

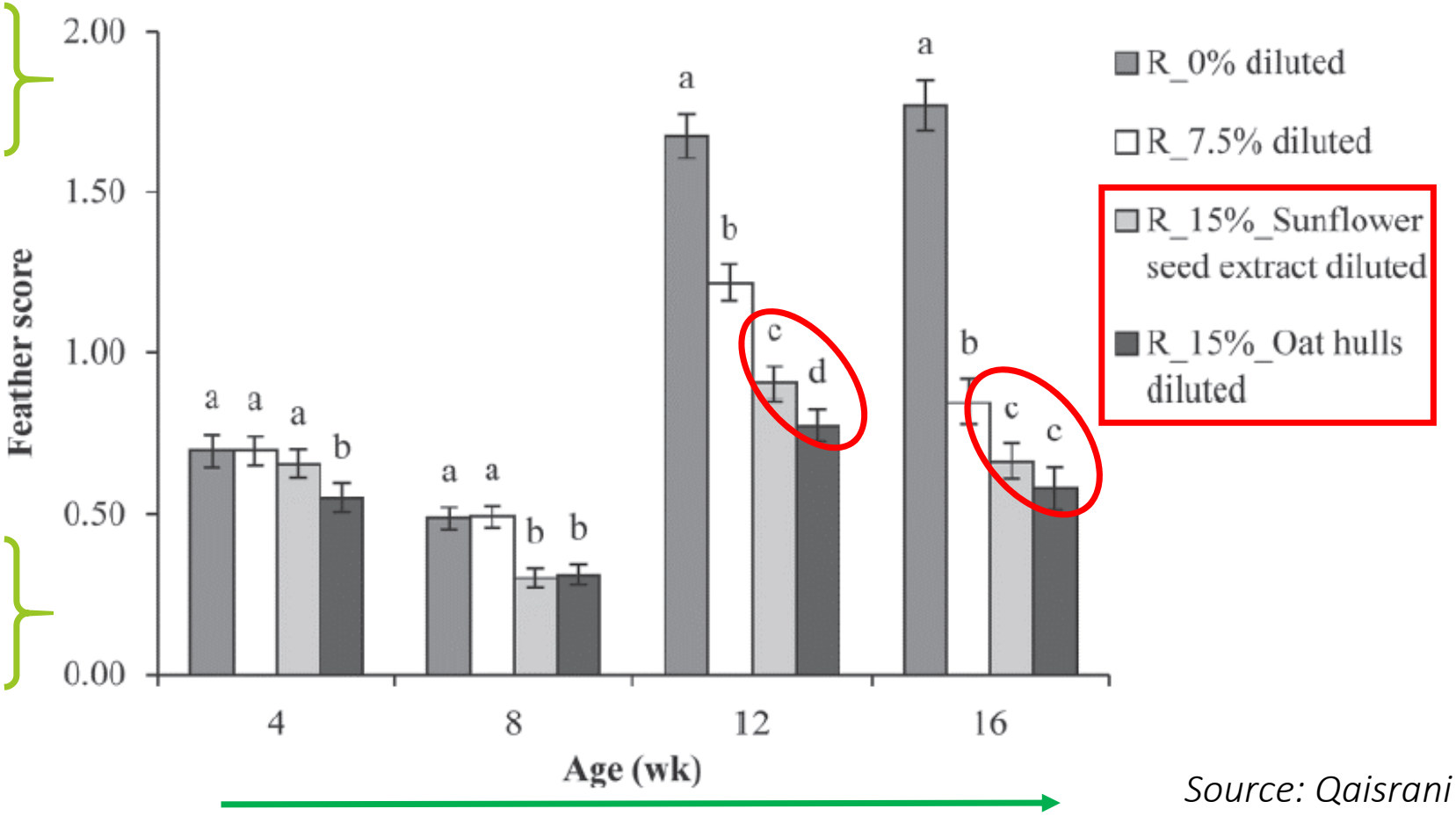
Oat hulls: General Mills, 2011

- Coarse fiber provides structure to the diet and stimulate gastrointestinal movements
- It is needed by the birds, as an absence can result in eating of feathers as a substitute for fiber (feathers found in gizzard).
- Better effect on feather cover and docile behavior of coarse insoluble fiber versus finely ground
- Situation when fine instead of coarse insoluble fiber can be preferred: when recommendation is high energy and high fiber diets and facing a situation of low feed intake. E.g. Lignocellulose in starter diet and / or hot climate diet.

Feather condition and insoluble fiber in rearing

Bad feather cover

Good feather cover



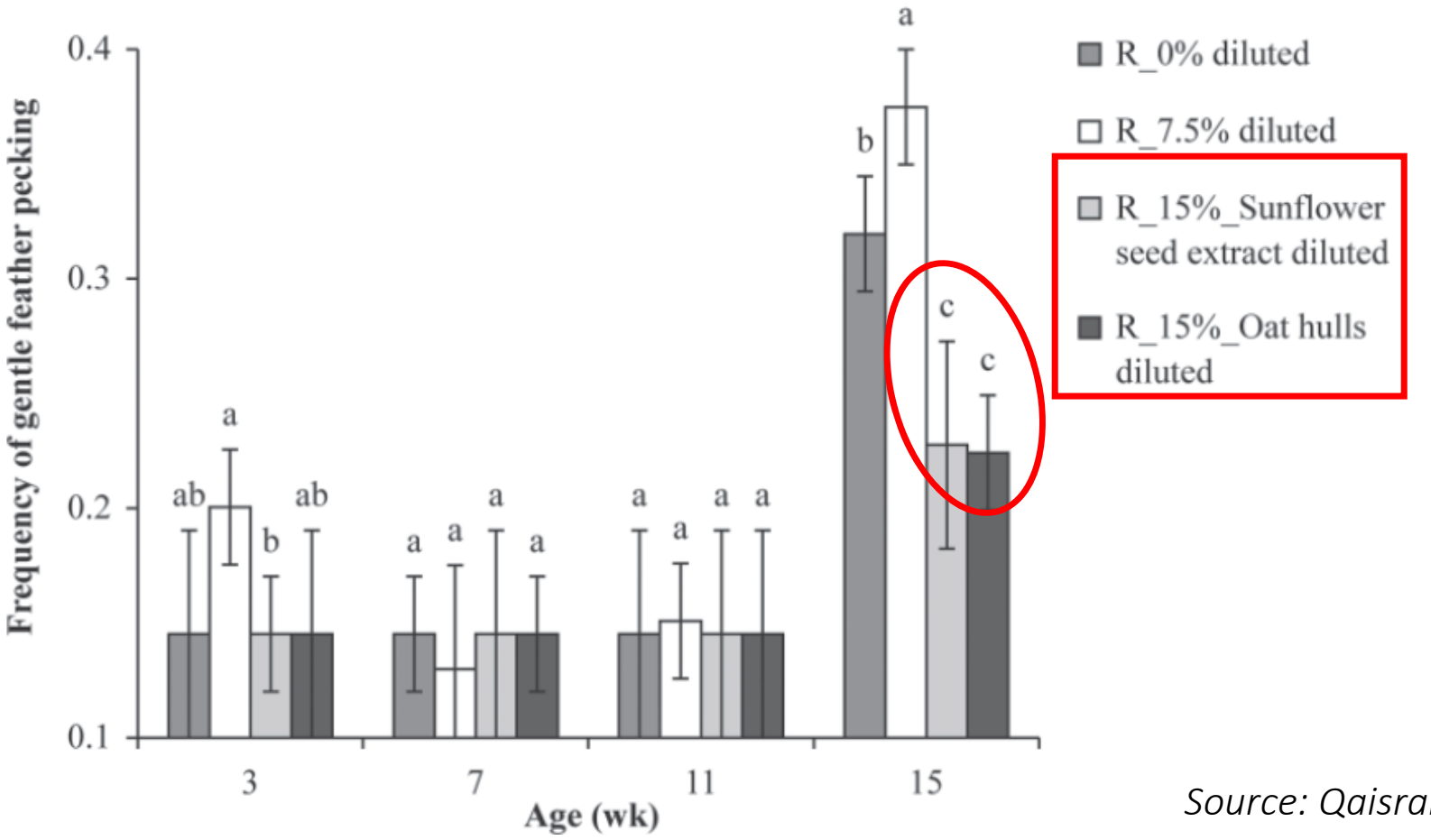
Source: Qaisrani et al., 2013

Positive effect insoluble fiber on feathers increase with age

Feather pecking and insoluble fiber in rearing

More pecking

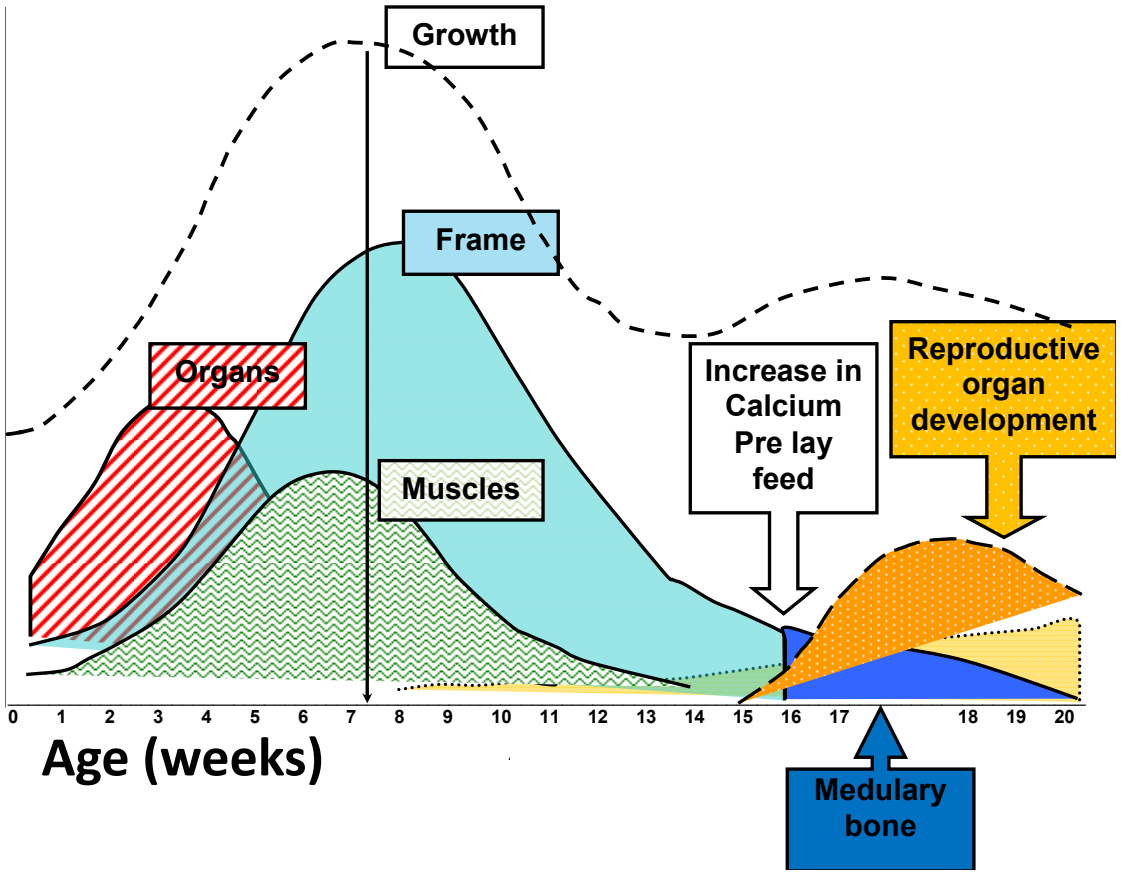
Less pecking



Source: Qaisrani et al., 2013

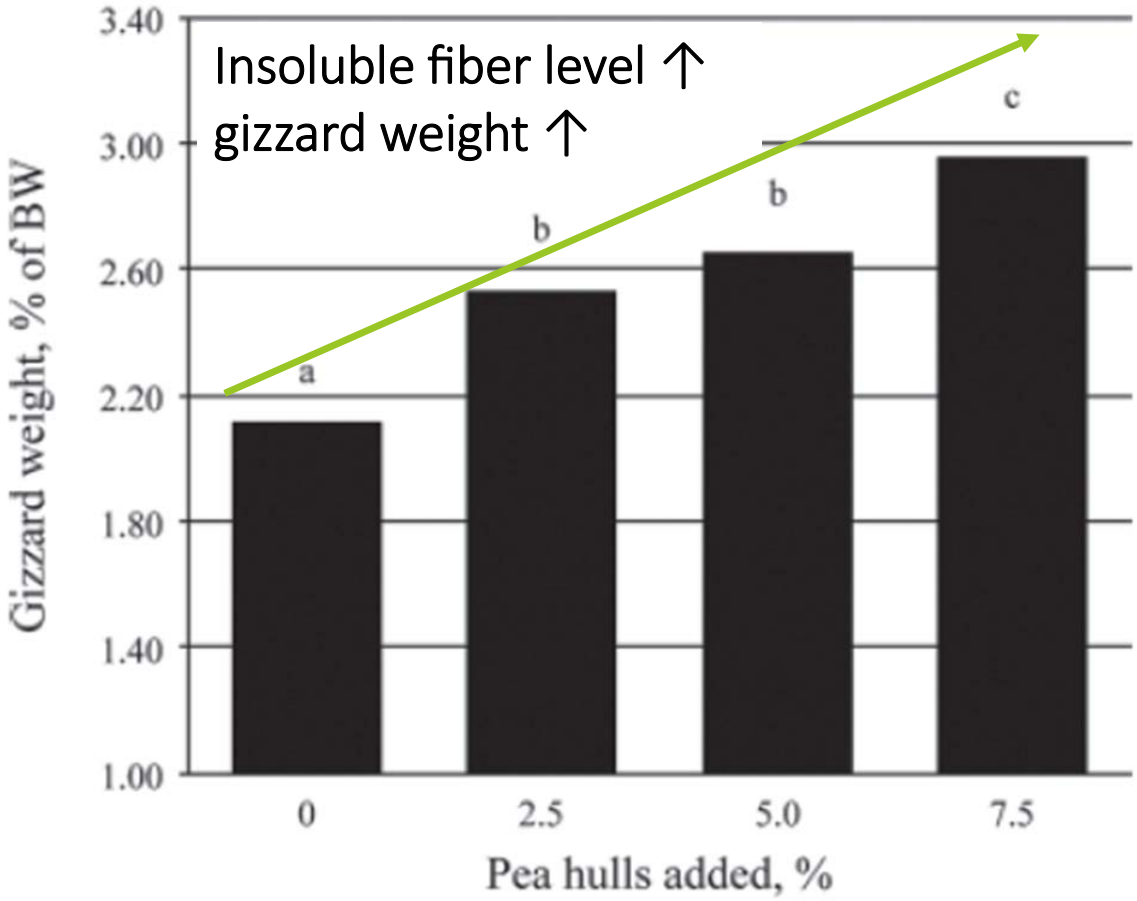
Positive effect of insoluble fiber on feather pecking behavior at end of rearing

Prepare the pullet – Phases in rearing



- Organ development: 0 to 5 weeks
- Skeletal development: peak at 7 weeks
- Gastrointestinal tract development and **feed intake capacity development: between 10 and 16 weeks**
- Medullary bone development: end of rearing

Gizzard development and insoluble fiber in rearing



Weight of gizzard during rearing

is an indicator for

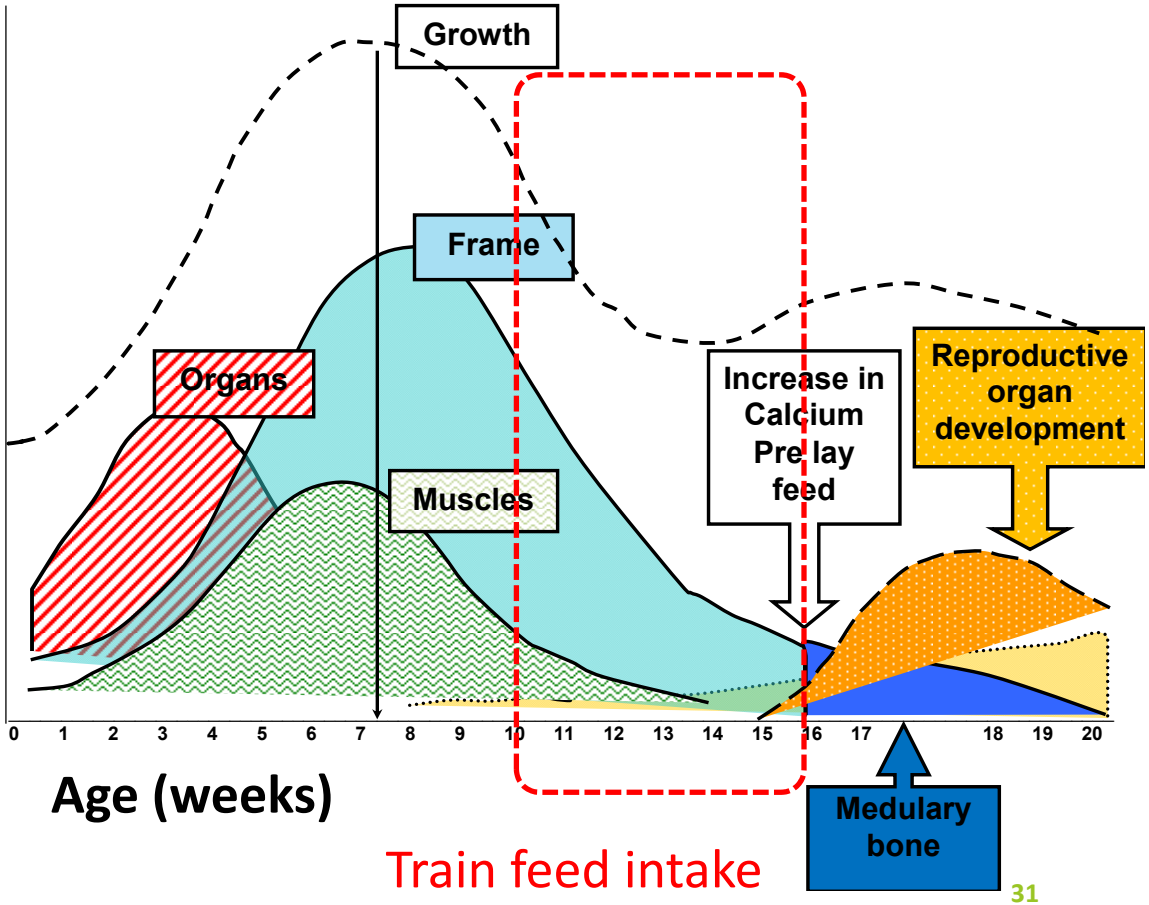
Feed intake capacity during start of lay

High feed intake capacity at start of lay ensures sufficient feed intake, **quickly reach mature body weight** and **prevents nutrient deficiencies** of e.g. amino acids

Source: Mateos et al., 2012

Prepare the pullet - Train to eat

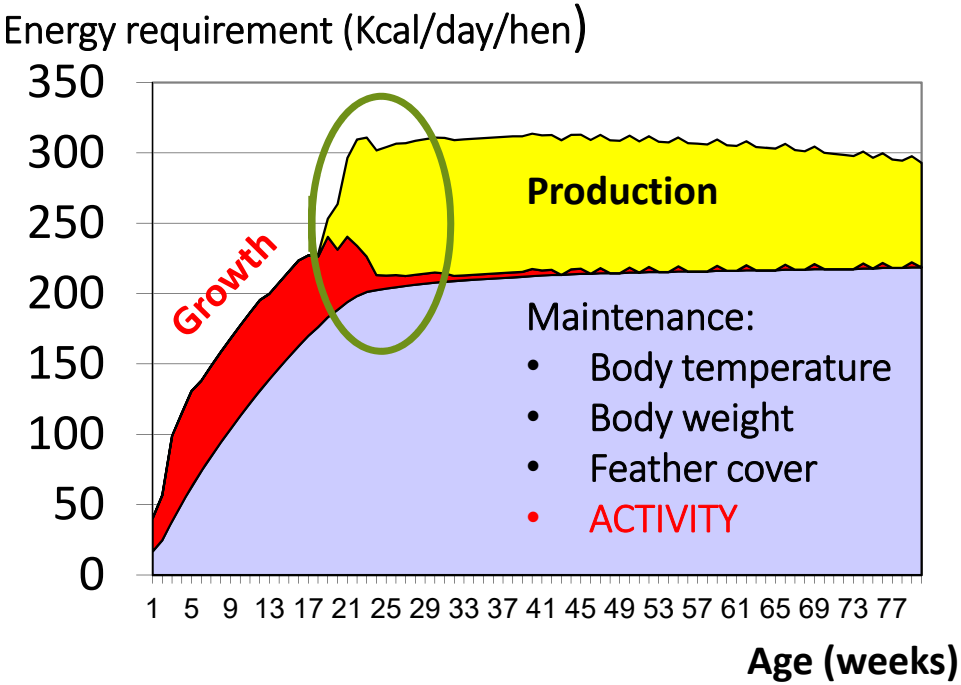
- Objective: develop sufficient feed intake capacity for period start of lay
- Period: Developer feed 10-16 weeks
- Diluted diet with high insoluble fiber
- Feed method = empty feeder technique to develop feed intake capacity (crop and gizzard)
- Train the birds to eat !



Feed intake capacity & growth at start of lay

Layers grow until 30 weeks

- Target: Reach **mature body weight** quickly
- Note: Growth not yet finished at start lay
- Objective: **Increase feed intake** quickly at start of lay
- Management: Feed intake capacity developed during **rearing period**



Challenge in alternative system: high fiber AND high energy requirements

Solution = higher feed intake level to meet both fiber and energy requirements for good production and well managed flock

Conclusion
How to feed layers in alternative systems

1. **Energy** higher requirements for birds in alternative systems especially aviary and free range
2. **Amino acids** same requirements as production performance is the same
3. **Feed particle size** more coarse particles and uniformity more important
4. **Empty feeder technique** as important as in cage-housed birds
5. **Fiber** more focus on insoluble and coarse fibers

Thank you

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