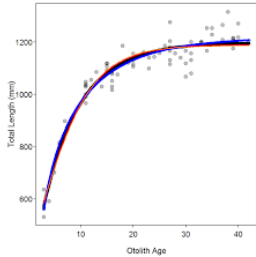




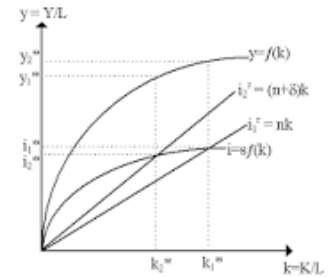
A growth model to predict body weight and body composition of broilers



Galyna Dukhta, György Kövér, Veronika Halas
Kaposvár University, Guba S. 40, 7400 Kaposvár, Hungary



Introduction



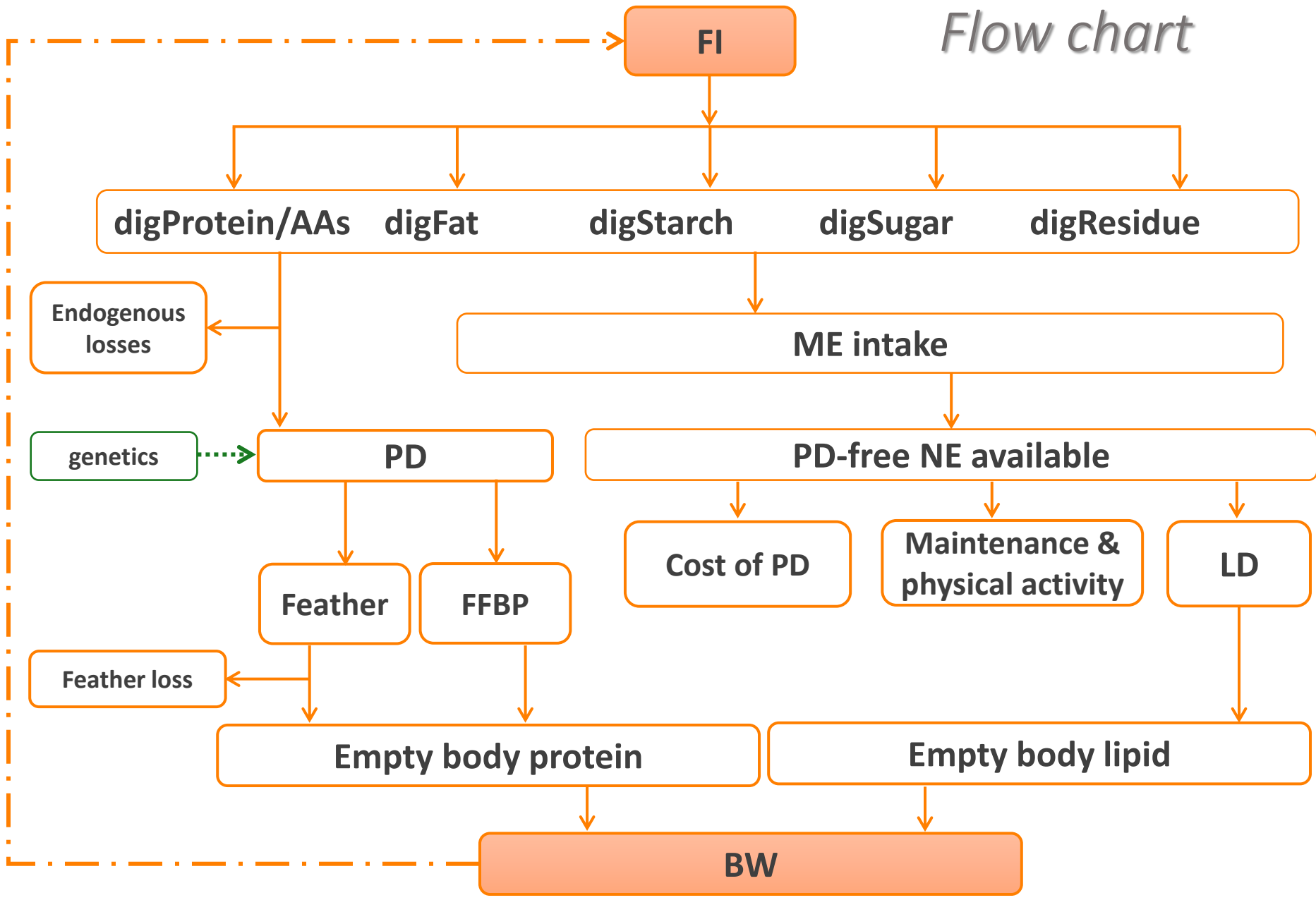
- Growth models have been developed for decades
- Static table values vs dynamic model values

Aim

- To introduce a broiler growth model predicting BW and chemical body composition from digestible nutrients
- To show some application of the model



Flow chart



Factors for energy conversion

Delicious!



Feed Intake

✓ Gamma function

$$NEI \text{ (MJ/d)} = (a \cdot b \cdot BW \cdot \exp(-b \cdot BW) + 1) \cdot c \cdot BW^d$$

a & b – depending on FI at 1 and 2 kg BW

Carré *et al.*, 2014

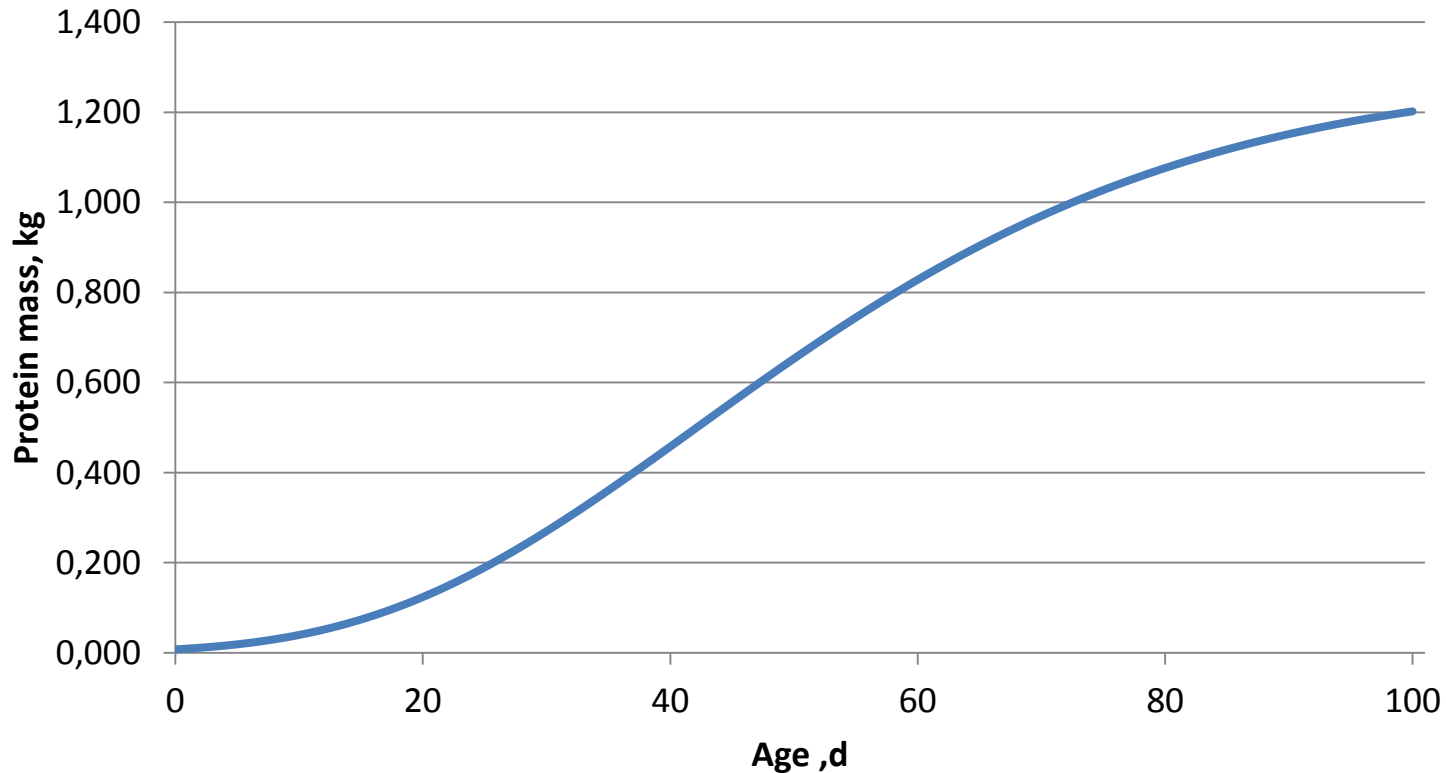
Values	Coef	Coef	Coef
	ME	AMEn	NE
	kJ/g		
CrudeFat	38.38	37.77	32.43
CrudeProt	20.60	18.36	14.32
Starch	17.00	16.67	13.28
Sugars	13.02	12.52	7.932
Residue	9.93	9.30	12.71

	InraPorc	Broiler model
c	0.75	0.8
d	0.6	0.7

Sophisticated Gompertz function for daily body protein deposition (PD)

$$W_t = W_m \cdot \exp [-\exp ((\ln (-\ln (W_i/W_m)) - (B \cdot t)))]$$

$$P_t = P_m \cdot \exp [-\exp ((\ln (-\ln (P_i/P_m)) - (B_{\text{prot}} \cdot t)))]$$



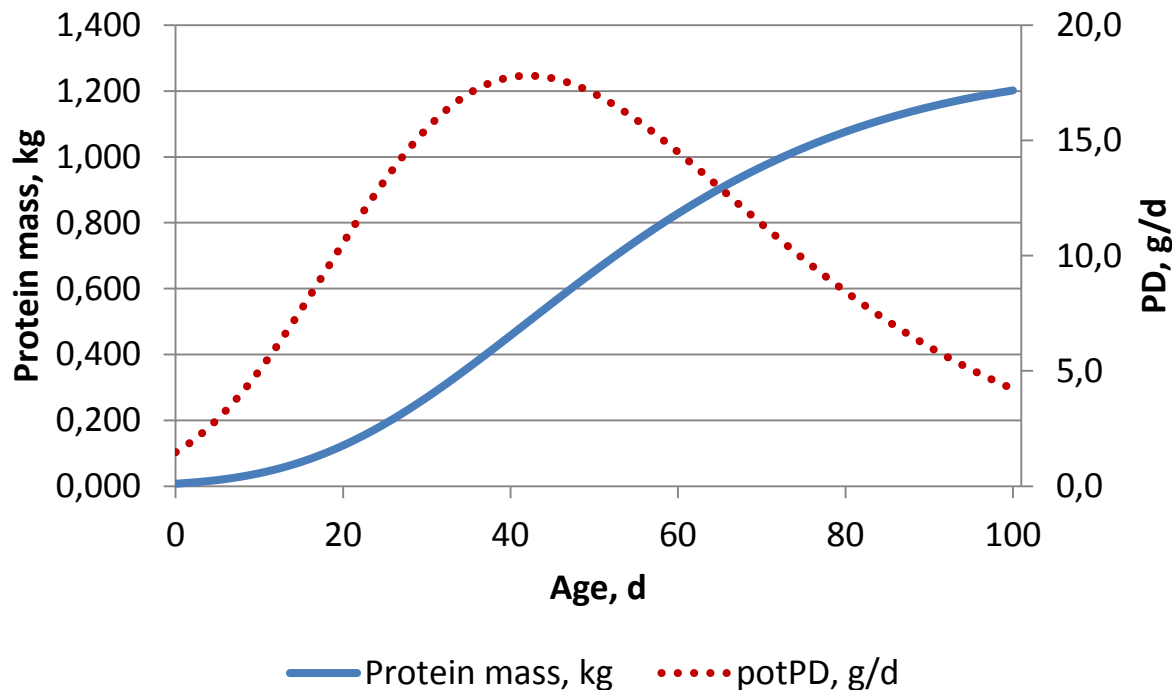
Sophisticated Gompertz function for daily body protein deposition (PD)

$$W_t = W_m \cdot \exp [-\exp ((\ln (-\ln (W_i/W_m)) - (B \cdot t)))]$$

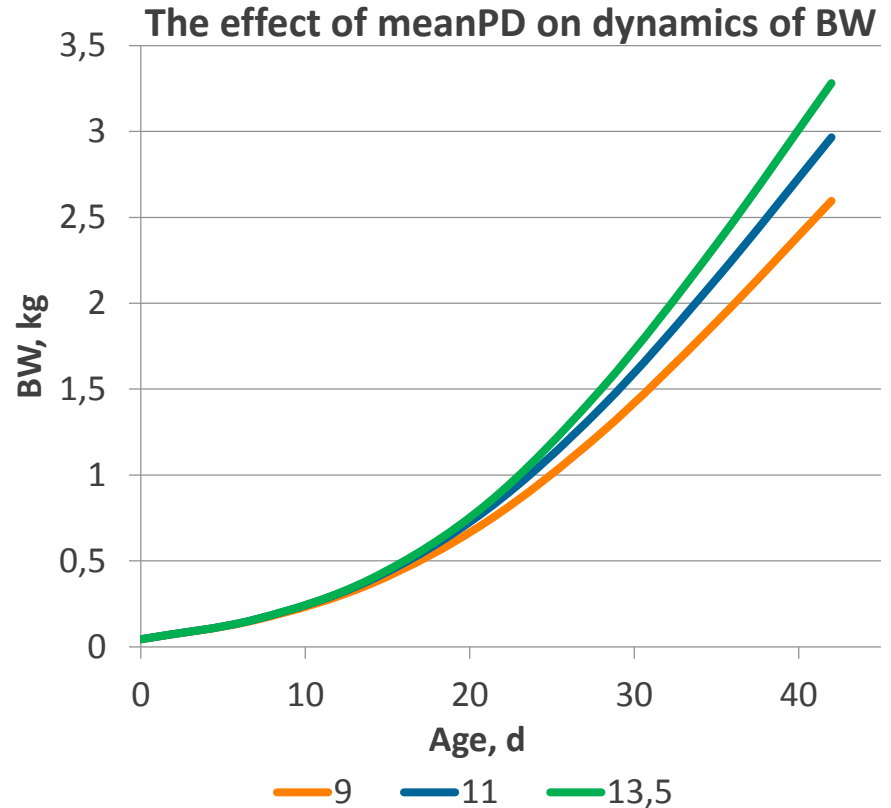
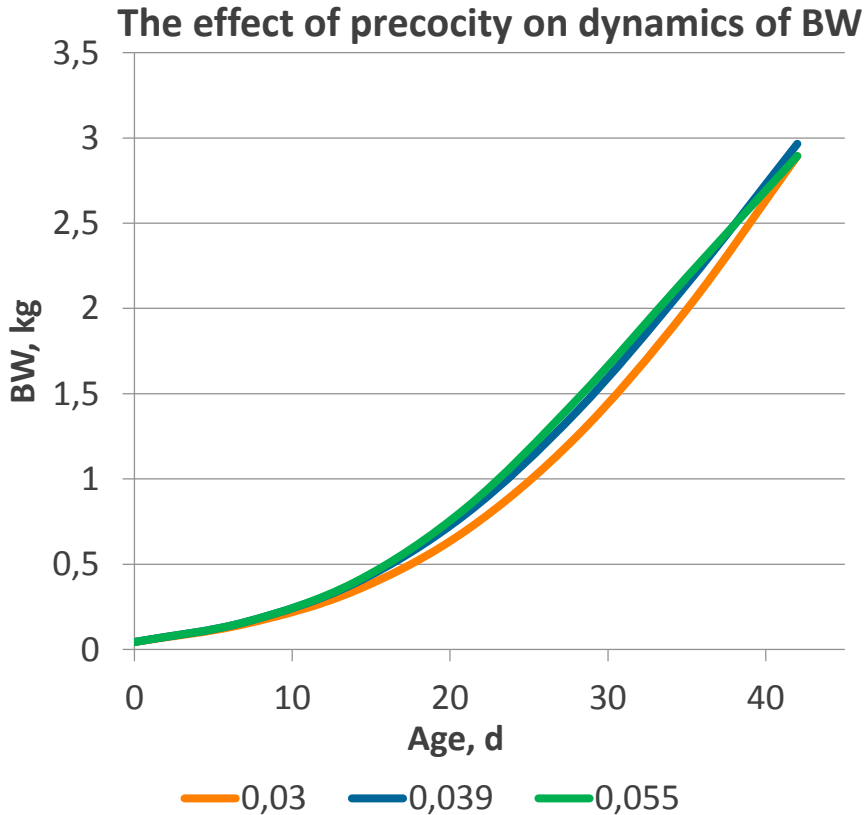
$$P_t = P_m \cdot \exp [-\exp ((\ln (-\ln (P_i/P_m)) - (B_{\text{prot}} \cdot t)))]$$



$$\text{Potential PD} = \text{precocity} \cdot \text{prot_init} \cdot \ln(P_m/\text{prot_init})$$



Model output



Body weight (BW) prediction for fixed mean PD (11 g/d) and different precocity parameter (left) and for fixed precocity (0.040) and different mean PD with (right)

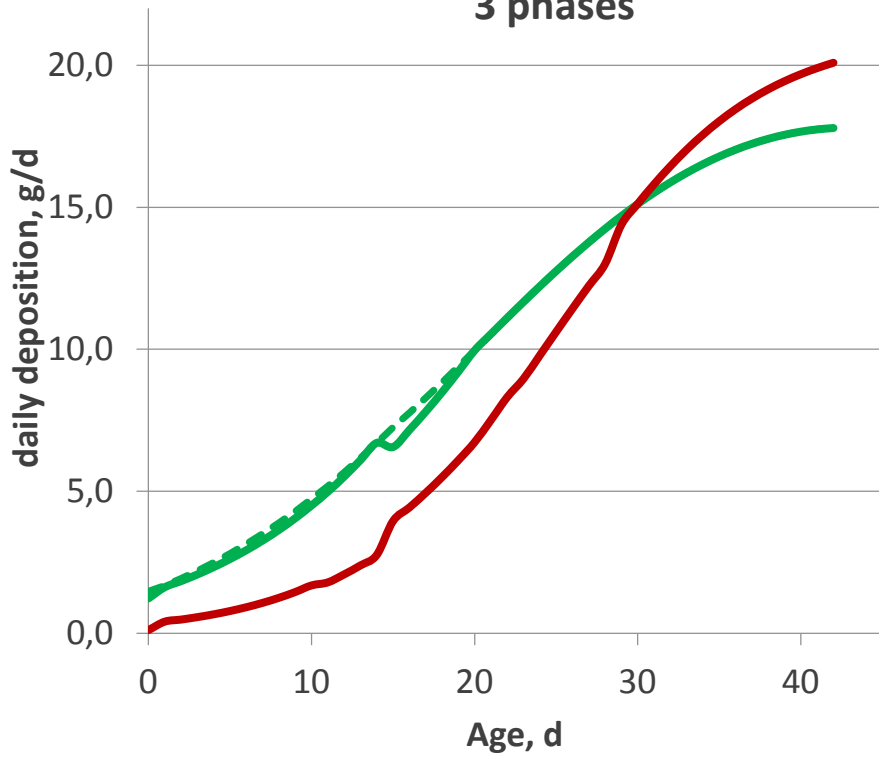
Nutritional composition of the diets

3 phases feeding			
	0-14 d	15-28 d	29-42 d
AMEn	13.00	13.00	13.00
CP	24	22	19
dig Lys	1.56	1.33	1.14
dig Met	0.55	0.47	0.40
dig Thr	0.90	0.80	0.71

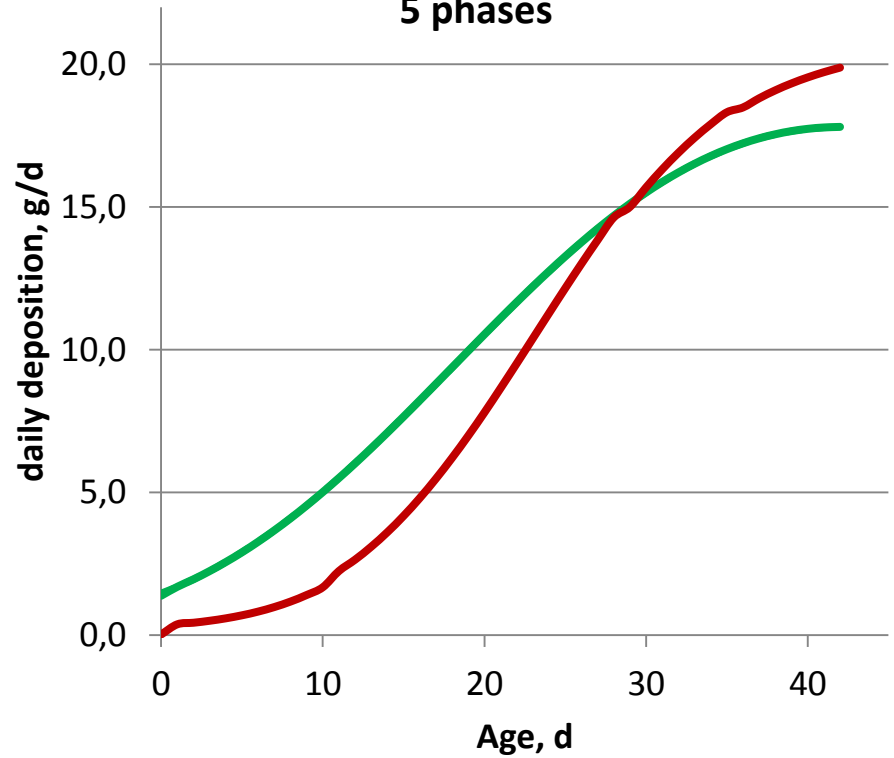
5 phases feeding					
	0-10 d	11-20 d	21-28 d	29-35 d	36-42 d
AMEn	13.00	12.99	12.84	12.56	12.36
CP	24	22	21	20	19
dig Lys	1.56	1.33	1.14	1.18	1.14
dig Met	0.55	0.47	0.40	0.42	0.40
dig Thr	0.90	0.80	0.75	0.72	0.71

Model application

3 phases

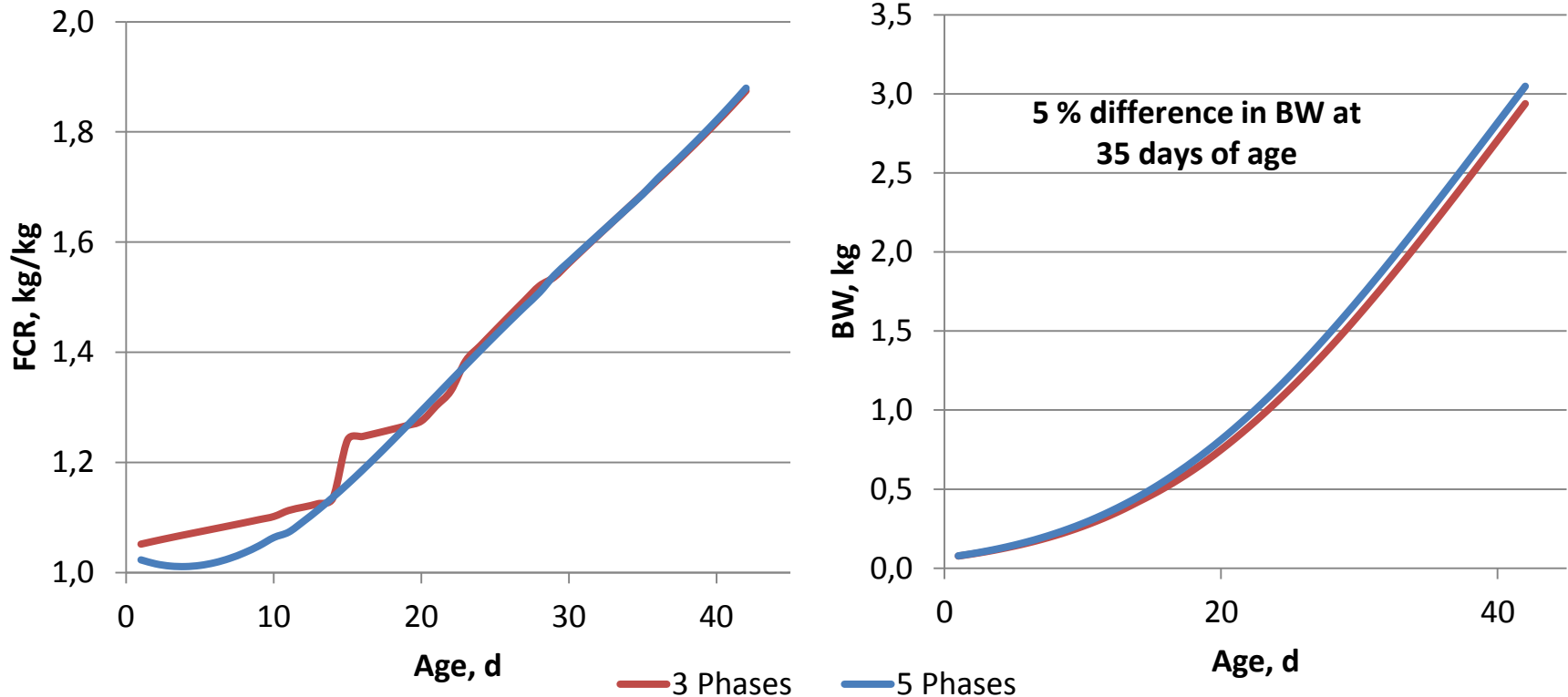


5 phases



— PD - - - potPD — Lipids

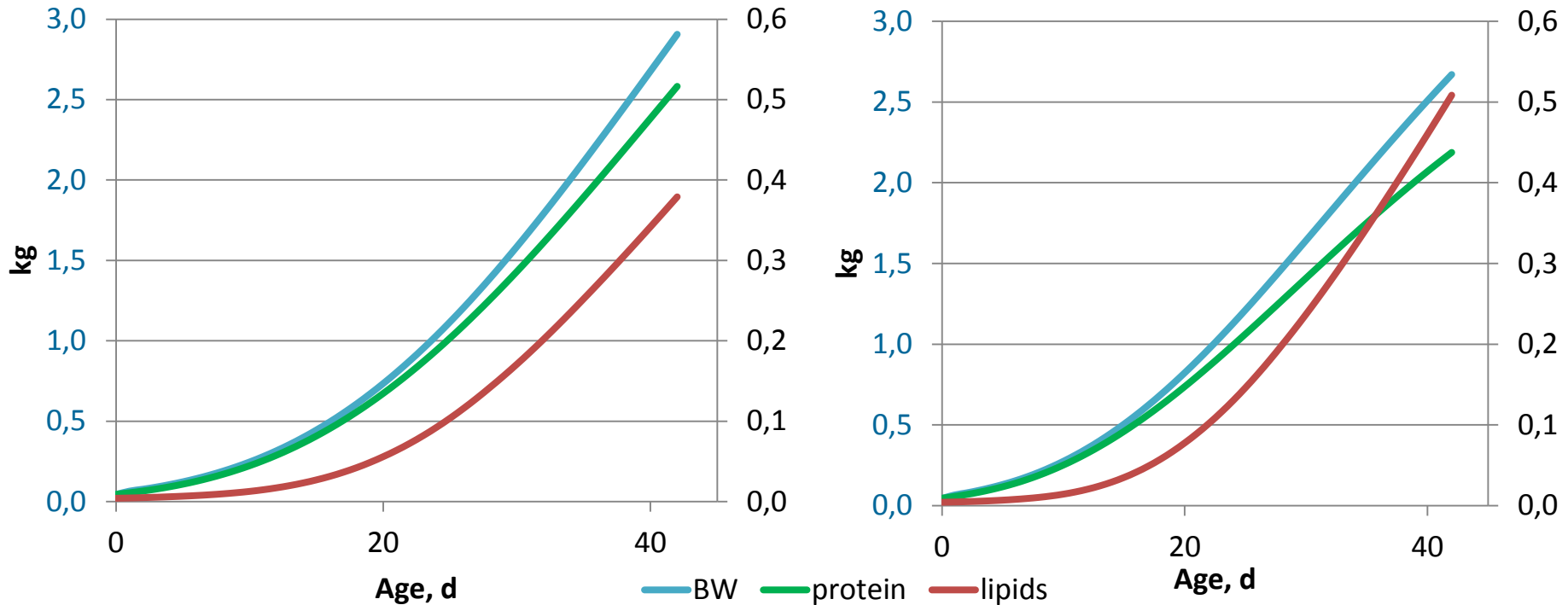
Comparison of FCR and BW with different phase feeding



Input parameters:

- FI at 1 kg BW – 1.2; at 2 kg BW – 1.9 kg
- precocity: 0.040; meanPD = 11 g/d; initial BW = 44 g; duration: 42 d

Body composition



Input parameters I:

- FI at 1kg BW – **1.2**; 2kg BW – **1.8** kg
- precocity: **0.040**; meanPD = **11** g/d;
initial BW = 44 g; duration: 42 d

Input parameters II:

- FI at 1kg BW – **1.3**; 2kg BW – **2** kg
- precocity: **0.055**; meanPD = **9** g/d;
initial BW = 44 g; duration: 42 d

Conclusion



- ▶ The examples provided in this presentation show the benefit of using mathematical models and their applicability in precision nutrition.
- ▶ It can be concluded that the growth model helps to apply “from desired feed to desired food” concept.

*Thank You for your
attention!*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 633531.

The publication is supported by the EFOP-3.6.3-VEKOP-16-2017-00008 project. The project is co-financed by the European Union and the European Social Fund.