How to improve lean meat percentage in TN Duroc progeny?

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Romy Helmons-Hendricks – Topigs Norsvin

Topigs Norsvin

Introduction

Romy Helmons-Hendricks

- The Netherlands
- Wageningen University & Research
  - BSc and MSc Animal Sciences (Nutrition)

- Since April 2021 started working at Topigs Norsvin
  - Global Nutrition Specialist
  - Global Nutrition and Female Reproduction Services
  - Nordics, Baltics, UK, Ireland, France, Germany & South Africa

Today’s program

1. TN Duroc characteristics
2. Performance results
3. Feeding TN Duroc
4. Practical diets Estonia
5. Management tips
6. Take-home messages

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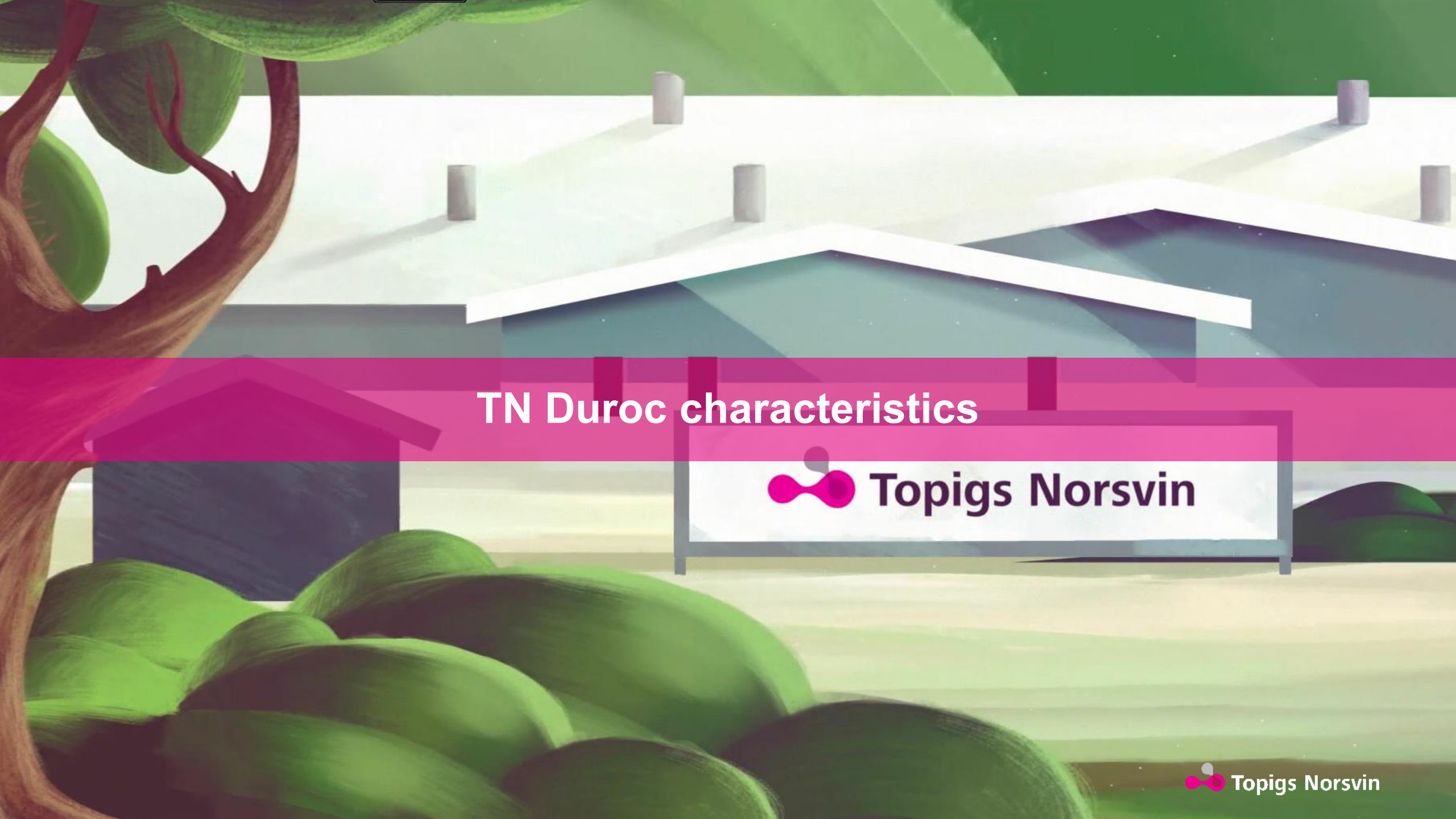
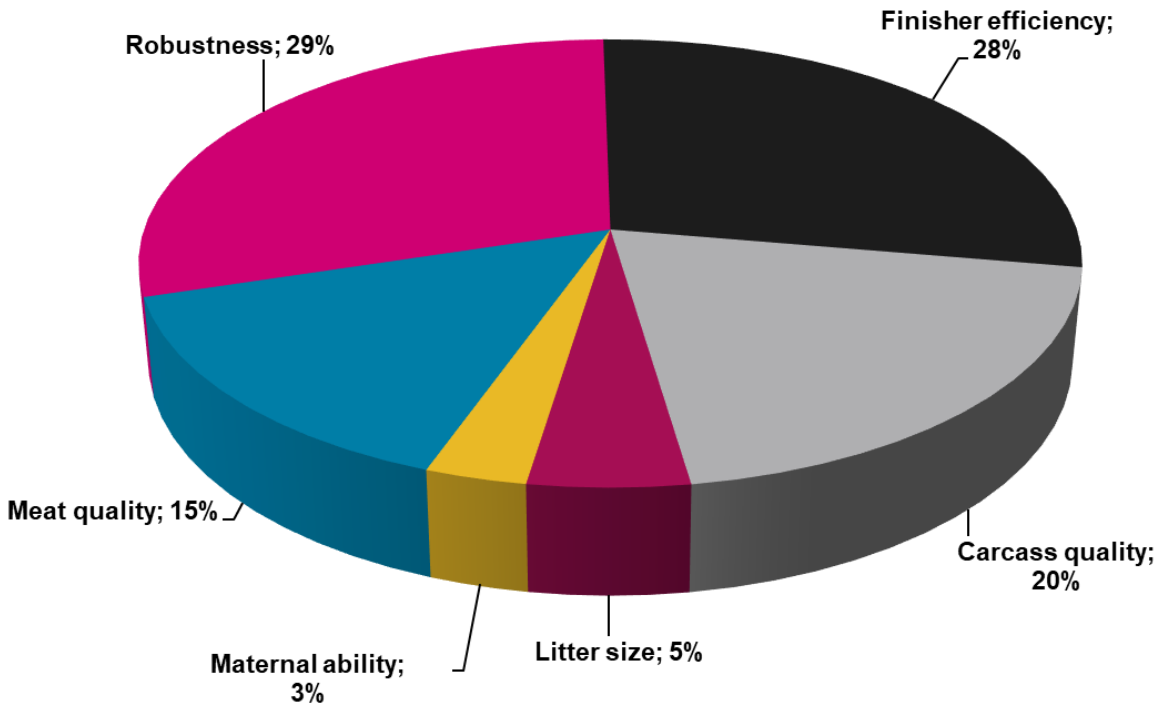
TN Duroc characteristics



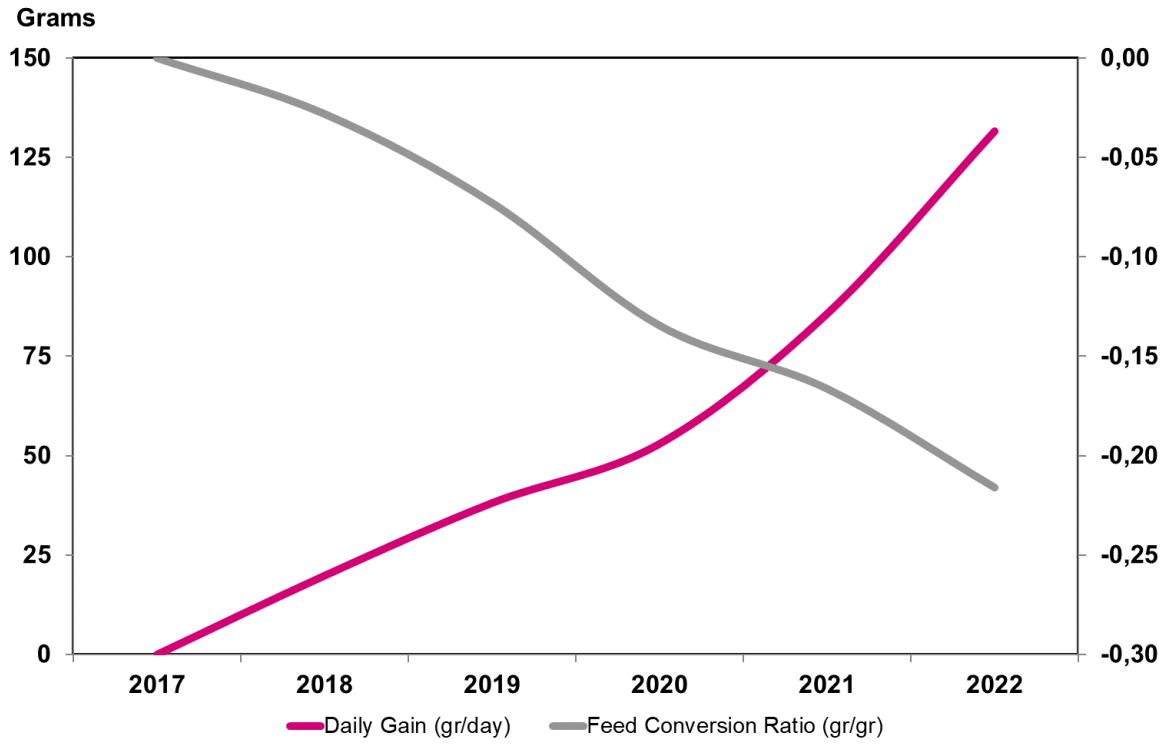
TN Duroc

Breeding goal
Anno 2025

- Today's breeding goal includes a total of 33 different traits
- In 2021, carcass yield and primal yields were included in the breeding goal
- In 2024, iodine value (fat quality) and feed intake variation (disease resilience) were added



TN Duroc



Genetic trends

- **Over 130 g daily gain and 0.22 improvement in feed conversion in five years**
- Strong improvement in efficiency supported by large scale feed intake registration and CT-scanning

TN Duroc selection index

Main points

- Strong emphasis on improving daily gain and FCR
- Considerable emphasis on robustness traits
- Extra emphasis on improving belly yield
- Extra focus on meat quality

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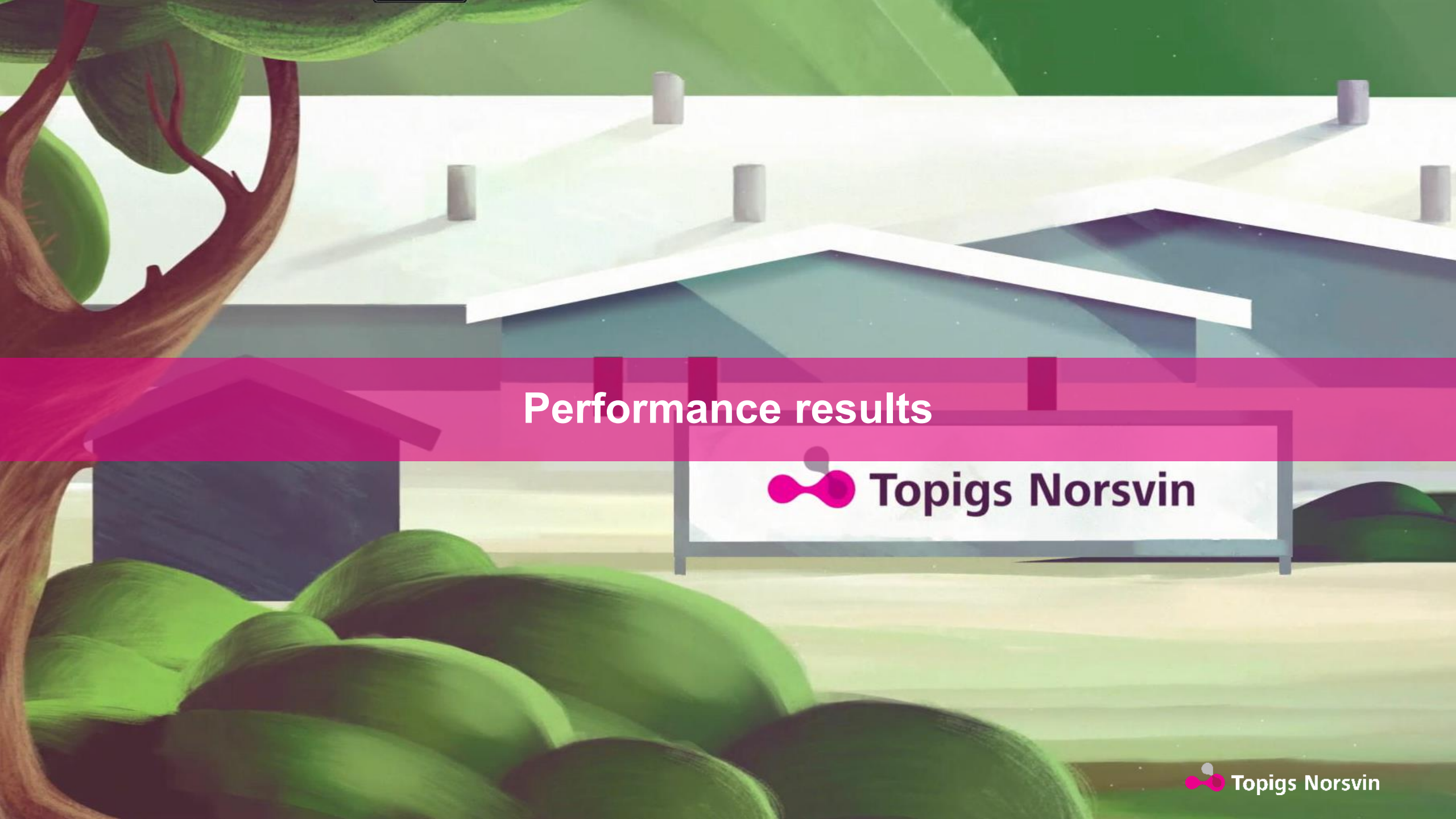
Performance results



Test performance results

Boars, Norway, 12 farms, 2023-2024

Trait	TN Duroc
No. pigs	*3919*
Weight at T-start, kg	31.4
Weight at T-end, kg	115.8
Std Test daily gain, g/d	1290
Std Test FCR	2.09
Std Backfat at T-end, mm	8.8
Std Loin depth at T-end, mm	55.1

Test performance results

Boars, USA, 2 farms, 2023-2024

Trait	TN Duroc
No. pigs	*5163*
Weight at T-start, kg	35.2
Weight at T-end, kg	116.3
Std Test daily gain, g/d	1259
Std Backfat at T-end, mm	9.4
Std Loin depth at T-end, mm	53.3

Grow-finish & carcass performance

Boars & gilts, the Netherlands, 2024

	TN Duroc*TN70
No. pigs	*526*
Start weight, kg	30.7
End weight, kg	121.7
Avg daily gain, g/d	1157
Hot carcass weight, kg	98.6
Backfat, mm	14.0
Loin depth, mm	67.6

Grow-finish & carcass performance

Norway, country average 2023

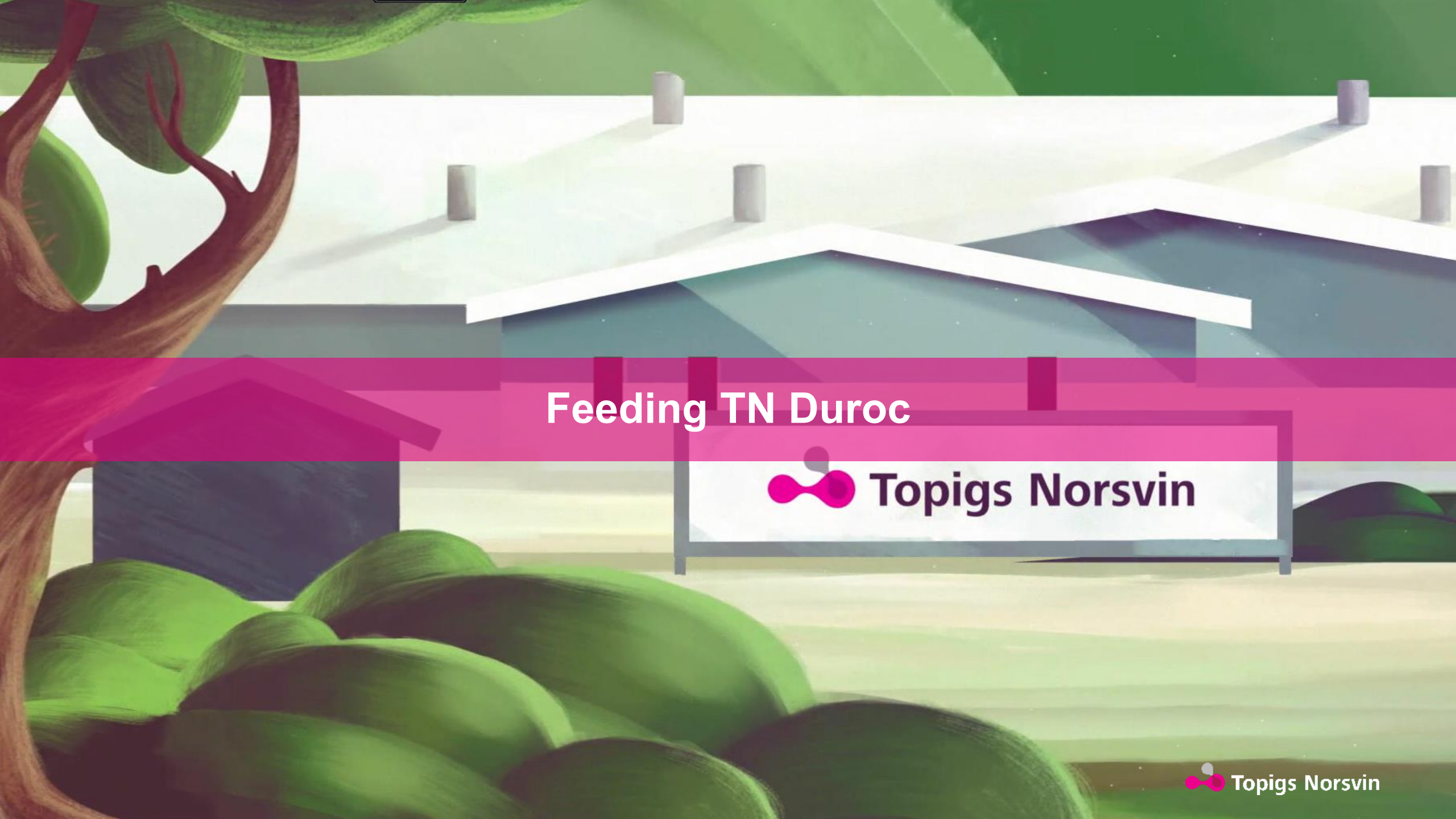
	Country avg
No. farms	*324*
Start weight, kg	31.6
Carcass weight, kg	84.4
Avg daily gain, g/d	1131
Feed conversion, FEn/kg gain	2.69
Lean meat, %	60.4
Mortality, %	1.5

Genetic expression

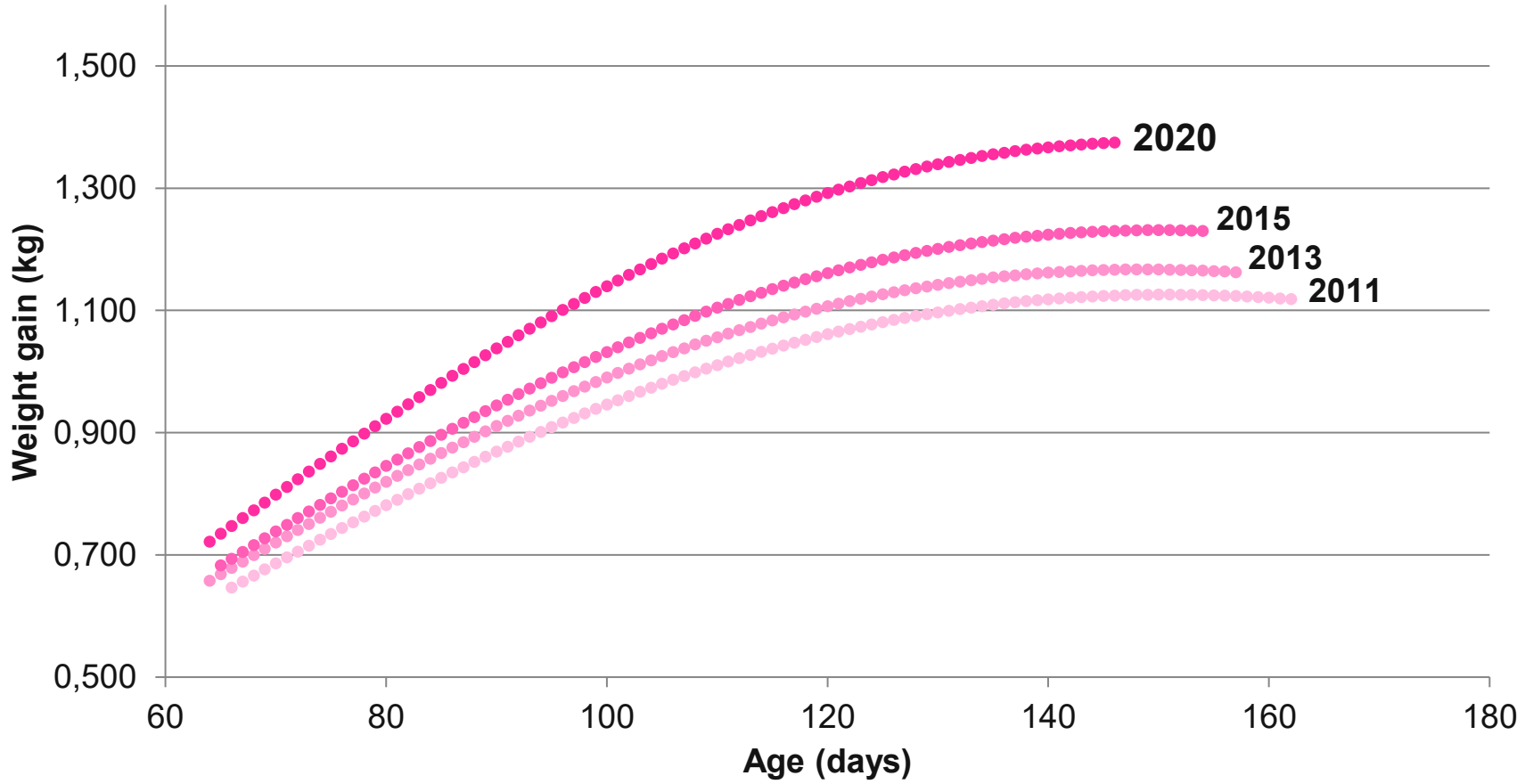
TN Duroc – boar testing (purelines) in Delta Norway

Sex Code	Line Code	Date Tstart	Date Tend	Age Tend	Weight Tend	Std Test Daily Ga	Std Feed Conversion Rat
Boar	DDDD	15-Aug-24	09-Oct-24	133	136,7	1821	2,02272
Boar	DDDD	05-Sep-24	06-Nov-24	136	129,7	1767	1,74646
Boar	DDDD	05-Sep-24	06-Nov-24	132	127,5	1696	1,73285
Boar	DDDD	15-Aug-24	14-Oct-24	138	139	1669	1,78904
Boar	DDDD	05-Sep-24	12-Nov-24	142	133,5	1659	1,83685
Boar	DDDD	05-Sep-24	12-Nov-24	147	132,1	1644	1,67787
Boar	DDDD	15-Aug-24	02-Oct-24	137	136,2	1636	1,8156
Boar	DDDD	05-Sep-24	06-Nov-24	136	131,3	1601	2,02478

Feeding TN Duroc



Genetic trend of the TN Duroc



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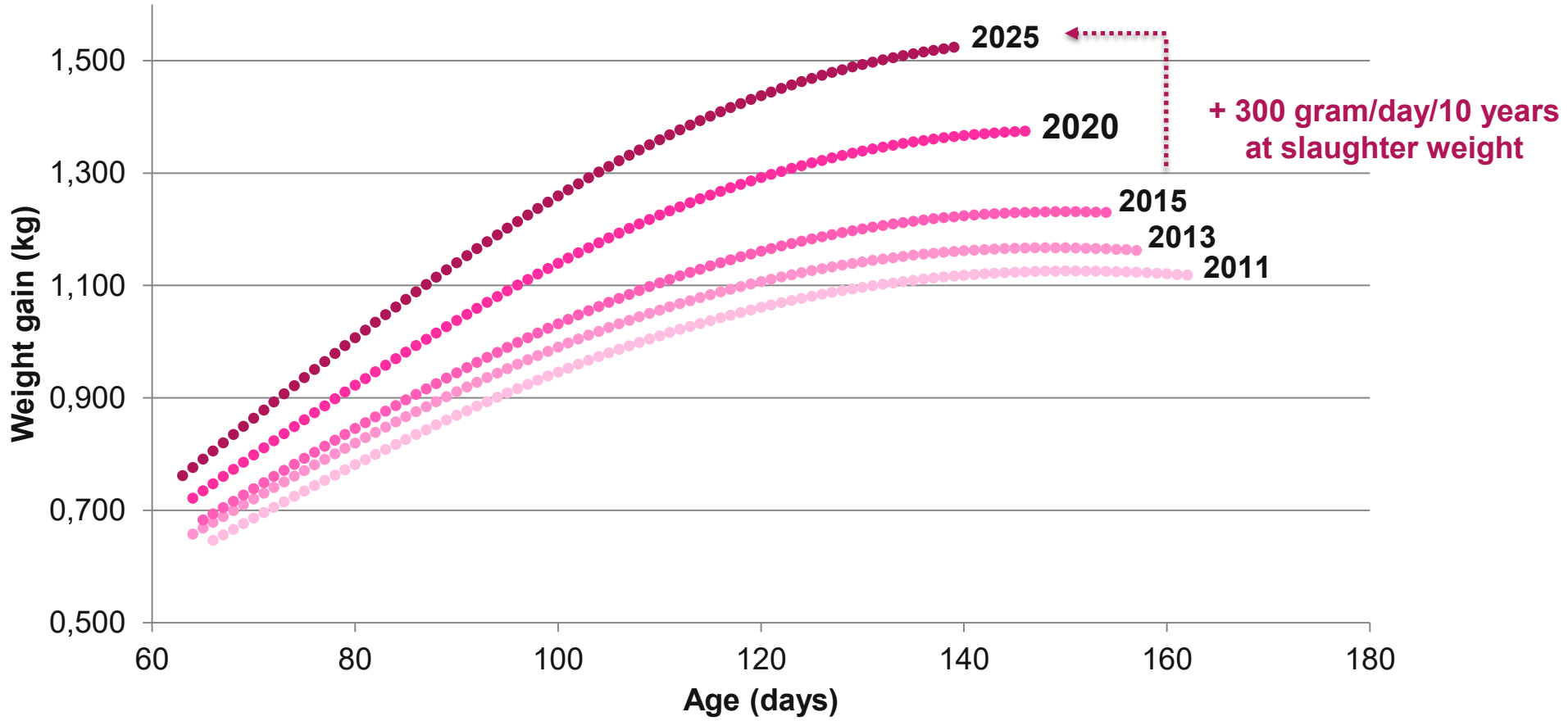
Genetic trend of the TN Duroc



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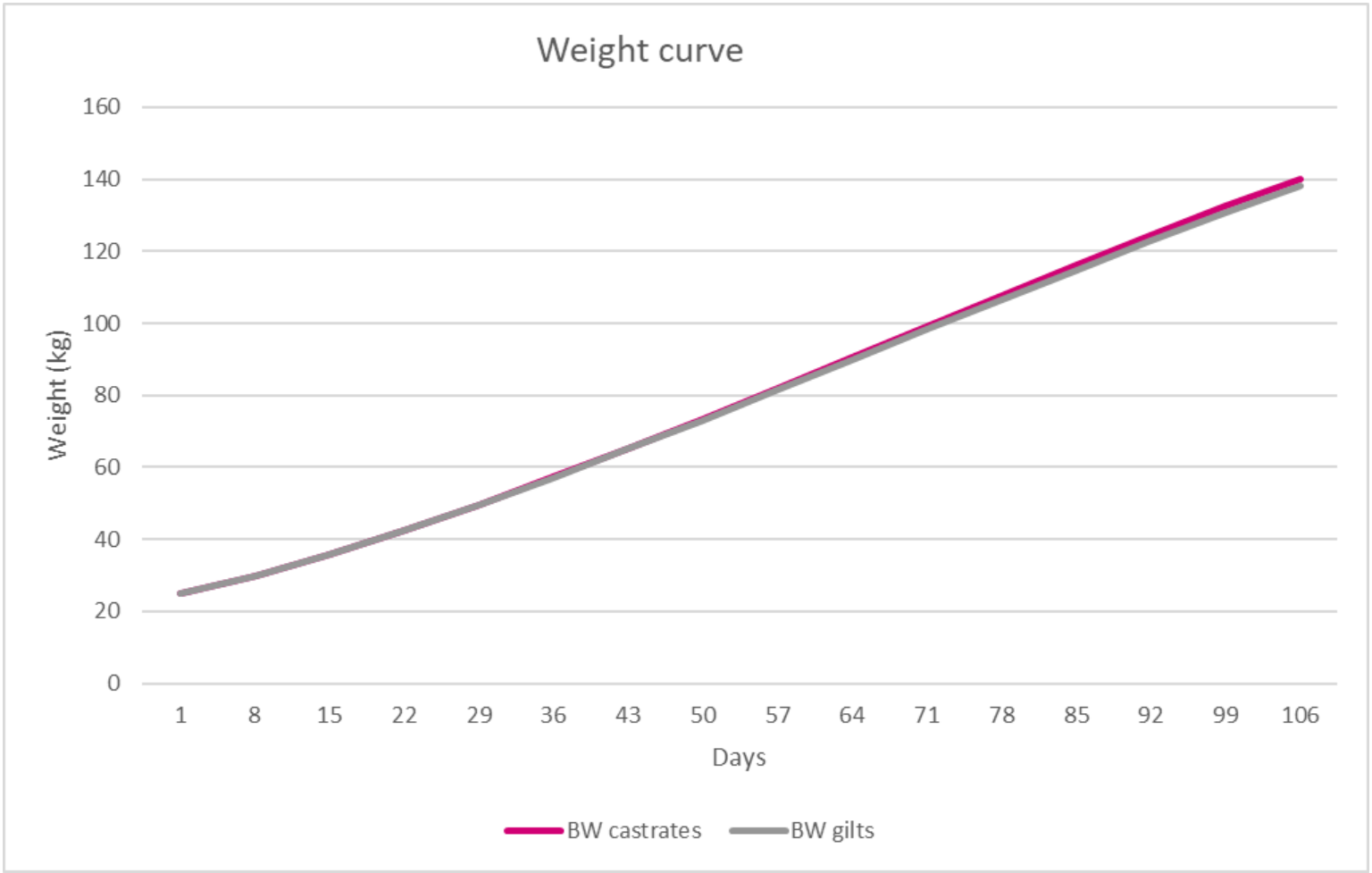
Aim of the TN Duroc manual

- Provide a practical feeding guide based on:
  - Achieving genetic potential
  - Nutritional requirements
  - Practical information for optimal feeding TN Duroc x TN70 offspring

Weight development TN Duroc



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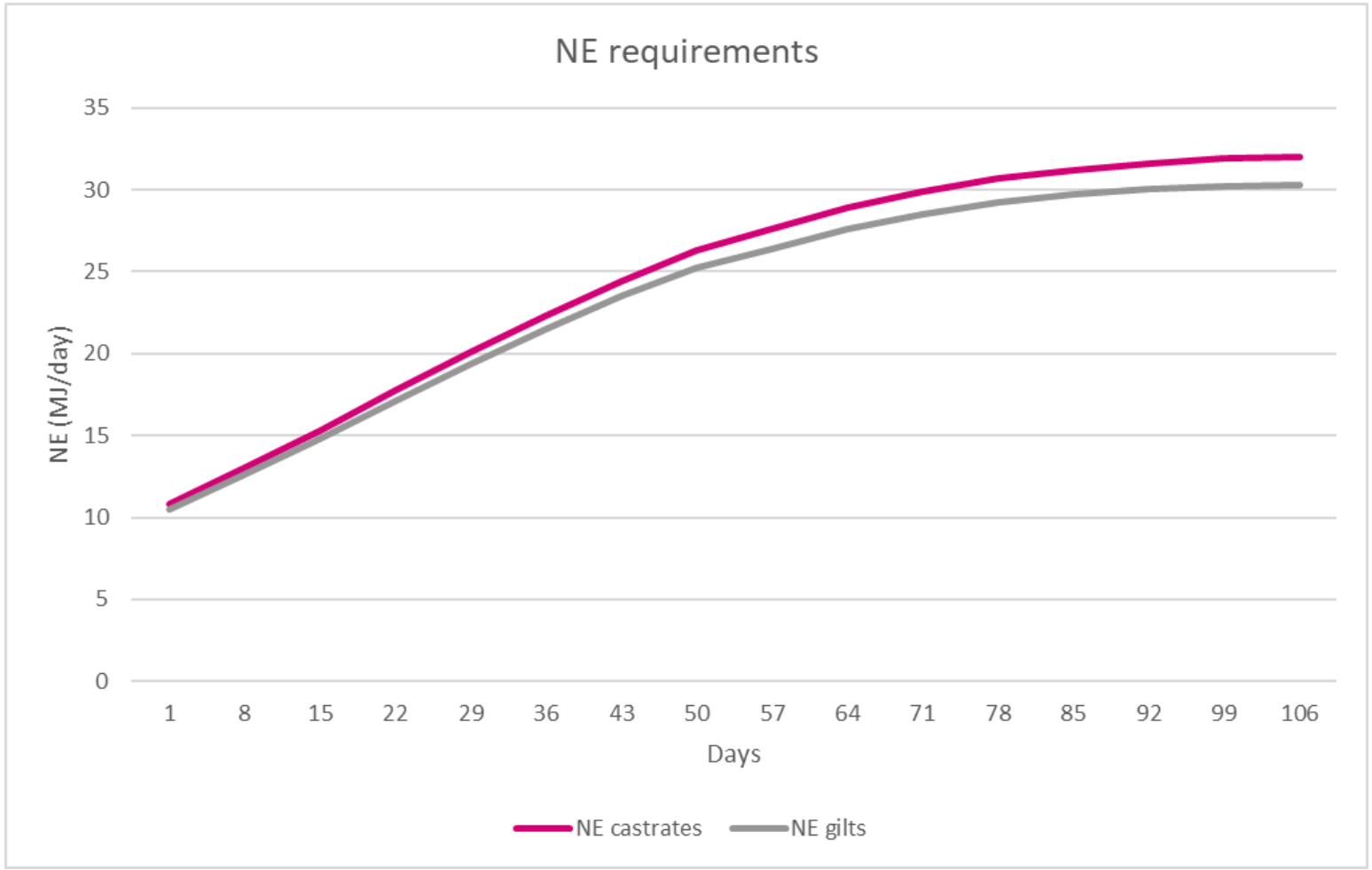
Daily requirements Net Energy TN Duroc

Estimated for maximum performance (daily gain)



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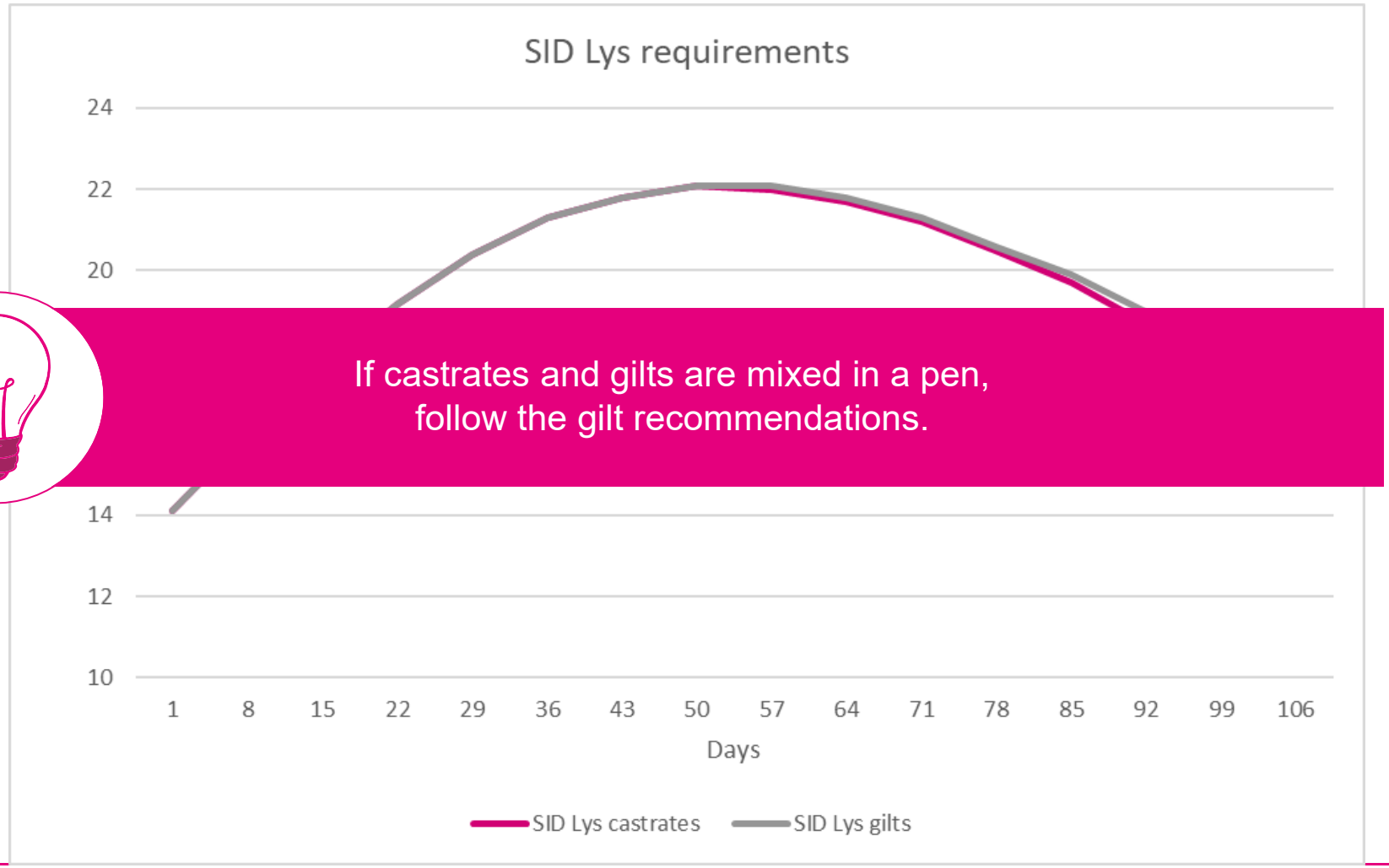
Daily requirements SID Lysine TN Duroc

Estimated for maximum performance (daily gain)



If castrates and gilts are mixed in a pen,
follow the gilt recommendations.

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Daily requirements TN Duroc finishers

Estimated for maximum performance (daily gain)

Days in	Castrates			Gilts			Boars		
	BW, kg	NE, MJ/day[1]	SID Lys, g/day[1]	BW, kg	NE, MJ/day[1]	SID Lys, g/day[1]	BW, kg	NE, MJ/day[1]	SID Lys, g/day[1]
1	25.0	10.8	14.1	25.0	10.5	14.1	25.0	9.8	14.0
8	29.9	13.0	16.0	29.9	12.6	16.0	30.1	12.1	15.6
15	35.9	15.3	17.7	35.9	14.8	17.7	36.2	14.5	17.6
22	42.5	17.7	19.2	42.5	17.1	19.2	43.0	16.9	19.4
29	49.7	20.1	20.4	49.6	19.4	20.4	50.3	19.3	20.9
36	57.3	22.3	21.3	57.1	21.5	21.3	58.1	21.5	22.1
43	65.3	24.4	21.8	65.0	23.5	21.8	66.4	23.4	22.9
50	73.5	26.3	22.1	73.1	25.2	22.1	74.9	25.1	23.4
57	82.0	27.6	22.0	81.4	26.4	22.1	83.7	26.5	23.6
64	90.5	28.9	21.7	89.8	27.6	21.8	92.5	27.7	23.5
71	99.1	29.9	21.2	98.2	28.5	21.3	101.4	28.6	23.2
78	107.7	30.7	20.5	106.6	29.2	20.6	110.2	29.3	22.7
85	116.1	31.2	19.7	114.8	29.7	19.9	118.9	29.9	22.0
92	124.3	31.6	18.7	122.9	30.0	19.0	127.4	30.3	21.1
99	132.4	31.9	17.8	130.7	30.2	18.0	135.6	30.6	20.2
106	140.2	32.0	16.8	138.2	30.3	17.0	143.5	30.9	19.2

Implementation TN Duroc diets

Based on farm feed intake (our recommendations)

Sex	Body Weight (kg)	Starter	Grower 1	Grower 2	Finisher	Final
		25 - 35	35 - 55	55 - 75	75 - 100	100 - 130
Castrates	Ave Daily feed intake, kg/day [1]	1.3	1.8	2.4	2.8	3.1
	NE, MJ/kg [2, 3]	10.3	10.2	10.1	10.0	10.0
	ME, Mcal/kg [2, 3]	3.29	3.28	3.24	3.20	3.20
	SID Lys, g/kg [2]	12.6	10.7	9.1	7.8	6.6
	SID Lys/NE, g/MJ	1.22	1.04	0.89	0.77	0.66
	Ca, g/kg	9.0	8.5	7.4	6.7	6.0
	Available P, g/kg [4, 5]	4.7	4.4	3.9	3.7	3.6
	Digestible P, g/kg [4, 5]	3.6	3.3	2.8	2.5	2.2
Gilts	Ave Daily feed intake, kg/day [1]	1.2	1.8	2.3	2.7	3.0
	NE, MJ/kg [2, 3]	10.3	10.2	10.1	10.0	9.7
	ME, Mcal/kg [2, 3]	3.28	3.27	3.22	3.19	3.12
	SID Lys, g/kg [2]	13.0	11.0	9.4	8.1	6.5
	SID Lys/NE, g/MJ	1.26	1.08	0.93	0.81	0.67
	Ca, g/kg	9.2	8.6	7.6	6.8	6.1
	Available P, g/kg [4, 5]	4.9	4.6	3.9	3.7	3.5
	Digestible P, g/kg [4, 5]	3.7	3.3	2.8	2.5	2.3

Given this feed intake

Given this feed intake

Wheat-barley diet
Source: Appendix of the manual

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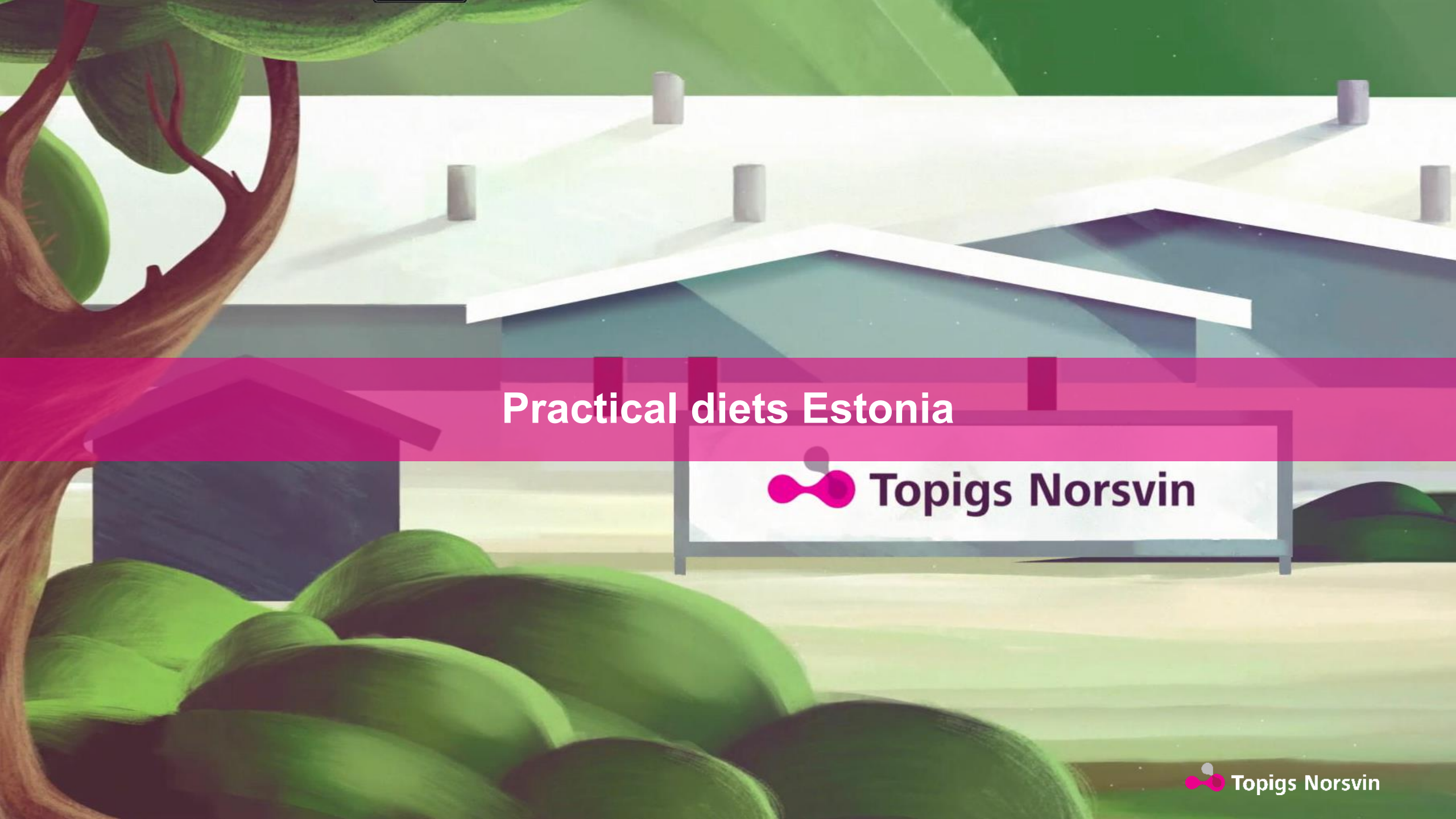
Practical diets Estonia



Practical diets Estonia

Growers & finishers

- **SID Lys and Net energy**
  - Energy can be higher
  - SID Lys 25-55 kg is low → impact on lean meat percentage

- **Ratio SID Lys/NE**
  - Grower 1,08 and Finisher 1,01
  - Grower 0,95 and Finisher 0,89 (liquid feed)

- **Topigs Norsvin advice**:

Body Weight (kg)	Starter	Grower 1	Grower 2	Finisher	Final
	25 - 35	35 - 55	55 - 75	75 - 100	100 - 130
Ave Daily feed intake, kg/day [1]	1.2	1.8	2.3	2.8	3.2
NE, MJ/kg [2, 3]	10.3	10.1	10.0	9.8	9.4
SID Lys, g/kg [2]	13.3	11.2	9.7	8.5	6.9
SID Lys/NE, g/MJ	1.30	1.11	0.98	0.87	0.73

	Unit	Grower 25-55 kg	Finisher 55-115 kg
FE	Fesv	1,04	1,01
Net energy	MJ	9,2	8,9
Crude protein	%	16,5	15,7
Crude fat	%	1,9	1,7
Fiber	%	3,7	4,5
Starch	g	440	435
St. dig lysine	g	9,9	9,0
St. dig lysine in liq. Feed	g	8,8	7,9
St. dig Met / St. dig Lysine		30	30
St. dig Met+Cys / St. dig Lysine		55	58
St. dig Thr / St. dig Lysine		64	64
St. dig Trp / St. dig Lysine		17	17
St. dig Val / St. dig Lysine		62	64
Calcium	g	7,2	6,5
Phosphorus	g	4,81	4,71
Dig. Phosphorus 0% fytase	g	2,20	1,82
Dig. Phosphorus 60% fytase	g	2,49	
Magnesium	g	1,37	1,56
Chlorine	g	3,84	3,66
Potassium	g	6,4	6,12
Iron added	mg	84	80
Copper added	mg	15,75	15
Manganese added	mg	42	40
Zinc added	mg	105	100
Iodine added	mg	0,22	0,21
Selenium added	mg	0,32	0,3
Vitamin A	i.e.	4200	4000
Vitamin D3	i.e.	420	400
Vitamin E	mg	42	40
Vitamin K3	mg	3,15	3
Vitamin B1	mg	2,1	2
Vitamin B2	mg	2,1	2
Vitamin B6	mg	3,15	3
Vitamin B12	mg	0,02	0,02
Niacin	mg	21	20
Biotin	mg	0,11	0,1
Pantothenic acid	mg	10,5	10

Practical diets Estonia

Growers & finishers

- **Ratio calcium to digestible phosphorus (Ca:STTD-P)**
- Topigs Norsvin focuses on bone mineralization → leg quality

Table 3. Ca:STTD-P and STTD-Ca:STTD-P ratios for different animal categories, adapted from Bikker et al. (2017).

Animal category	Ca:STTD-P
Growing pigs, 25-45 kg (55-99 lbs)	2.7
Growing pigs, 45-70 kg (99-154 lbs)	2.7
Growing pigs, 70-120 kg (154-265 lbs)	2.8
Sows in complete gestation	3.2
Sows in lactation	3.0

- Ratio in example diet is 2,9 (with 60% fytase)

	Unit	Grower 25-55 kg	Finisher 55-115 kg
FE	Fesv	1,04	1,01
Net energy	MJ	9,2	8,9
Crude protein	%	16,5	15,7
Crude fat	%	1,9	1,7
Fiber	%	3,7	4,5
Starch	g	440	435
St. dig lysine	g	9,9	9,0
St. dig lysine in liq. Feed	g	8,8	7,9
St. dig Met / St. dig Lysine		30	30
St. dig Met+Cys / St. dig Lysine		55	58
St. dig Thr / St. dig Lysine		64	64
St. dig Trp / St. dig Lysine		17	17
St. dig Val / St. dig Lysine		62	64
Calcium	g	7,2	6,5
Phosphorus	g	4,81	4,71
Dig. Phosphorus 0% fytase	g	2,20	1,82
Dig. Phosphorus 60% fytase	g	2,49	
Magnesium	g	1,37	1,56
Chlorine	g	3,84	3,66
Potassium	g	6,4	6,12
Iron added	mg	84	80
Copper added	mg	15,75	15
Manganese added	mg	42	40
Zinc added	mg	105	100
Iodine added	mg	0,22	0,21
Selenium added	mg	0,32	0,3
Vitamin A	i.e.	4200	4000
Vitamin D3	i.e.	420	400
Vitamin E	mg	42	40
Vitamin K3	mg	3,15	3
Vitamin B1	mg	2,1	2
Vitamin B2	mg	2,1	2
Vitamin B6	mg	3,15	3
Vitamin B12	mg	0,02	0,02
Niacin	mg	21	20
Biotin	mg	0,11	0,1
Pantothenic acid	mg	10,5	10

Practical diets Estonia

Growers & finishers

- Amino acid profile

Amino Acids[1]	Starterdiet	Grower diet	Finisher diet	Variation
Lysine	100	100	100	-
Met + Cys[2]	60	61	62	58-63
Tryptophan	20	20	20	17-23
Threonine	66	67	68	61-74
Valine	67	67	67	64-72
Isoleucine[3]	53	53	53	50-54
Leucine	100	100	100	100-102
Histidine	32	32	32	32-32
Phenylalanine+Tyrosine[4,5]	95	95	95	94-100

- Amino acid profile is important to meet biological needs of the animal
- Tryptophan (Trp) at 20 works positively on behavior.

	Unit	Grower 25-55 kg	Finisher 55-115 kg
FE	Fesv	1,04	1,01
Net energy	MJ	9,2	8,9
Crude protein	%	16,5	15,7
Crude fat	%	1,9	1,7
Fiber	%	3,7	4,5
Starch	g	440	435
St. dig lysine	g	9,9	9,0
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St. dig Met / St. dig Lysine		30	30
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Vitamin B1	mg	2,1	2
Vitamin B2	mg	2,1	2
Vitamin B6	mg	3,15	3
Vitamin B12	mg	0,02	0,02
Niacin	mg	21	20
Biotin	mg	0,11	0,1
Pantothenic acid	mg	10,5	10

Practical diets Estonia

Growers & finishers

- Vitamins
- Vitamin level in example diet are low.

- Vitamin A → immune function
- Vitamin D → leg quality
- Vitamin E → antioxidant

VITAMINS	Units	25 - 45 kg		45 - 75 kg		75 - End	
FAT SOLUBLE VITAMINS		Min	Max	Min	Max	Min	Max
VIT. A	i.u	6500	10000	6500	10000	5000	7500
VIT. D³	i.u	1500	2000	1500	2000	1000	2000
VIT. E	i.u	60	100	60	100	40	75
VIT. K³	mg	2	3	2	3	2	3
WATER SOLUBLE VITAMINS							
VIT. B_1 (Thiamine)	mg	2	3	2	3	2	3
VIT. B_2 (Riboflavin)	mg	7	10	7	10	5	8
VIT. B_3 (Nicotinic acid)	mg	20	40	20	40	20	30
VIT. B_5 (Pantothenic acid)	mg	25	45	25	45	25	45
VIT. B_6 (Pyridoxine)	mg	2	4	2	4	2	3
VIT. B_{12} (Cobalamin)	mcg	30	50	30	50	20	40
VIT. B_9 (Folic acid)	mg	1.0	1.5	1.0	1.5	0.5	1.0
VIT. B_7 (Biotin)	mg	0.05		0.05		0.05	
Choline	mg	150	300	150	300	100	200

	Unit	Grower 25-55 kg	Finisher 55-115 kg
FE	Fesv	1,04	1,01
Net energy	MJ	9,2	8,9
Crude protein	%	16,5	15,7
Crude fat	%	1,9	1,7
Fiber	%	3,7	4,5
Starch	g	440	435
St. dig lysine	g	9,9	9,0
St. dig lysine in liq. Feed	g	8,8	7,9
St. dig Met / St. dig Lysine		30	30
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Niacin	mg	21	20
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Pantothenic acid	mg	10,5	10

Practical diets Estonia

Growers & finishers

- Minerals
- Manganese: antioxidant, bone quality, metabolism
- Selenium: antioxidant and interaction with vitamin E
- Magnesium: helps positively on stress metabolism

MINERALS	Units	25 - 45 kg		45 - 75 kg		75 - End	
		Min	Max	Min	Max	Min	Max
Na	%	0.20	0.25	0.15	0.25	0.15	0.25
K	%		1.1		1.3		1.3
Mg	%		0.25		0.30		0.30
Fe	ppm	120		120		80	
I	ppm	1	2	1	2	1	2
Se	ppm	0.3	0.5	0.3	0.5	0.3	0.5
Cu	ppm	25		25		25	
Zn	ppm	120		120		100	
Mn	ppm	75		75		50	
Cl	%	0.15		0.15		0.15	

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Phosphorus	g	4,81	4,71
Dig. Phosphorus 0% fytase	g	2,20	1,82
Dig. Phosphorus 60% fytase	g	2,49	
Magnesium	g	1,37	1,56
Chlorine	g	3,84	3,66
Potassium	g	6,4	6,12
Iron added	mg	84	80
Copper added	mg	15,75	15
Manganese added	mg	42	40
Zinc added	mg	105	100
Iodine added	mg	0,22	0,21
Selenium added	mg	0,32	0,3
Vitamin A	i.e.	4200	4000
Vitamin D3	i.e.	420	400
Vitamin E	mg	42	40
Vitamin K3	mg	3,15	3
Vitamin B1	mg	2,1	2
Vitamin B2	mg	2,1	2
Vitamin B6	mg	3,15	3
Vitamin B12	mg	0,02	0,02
Niacin	mg	21	20
Biotin	mg	0,11	0,1
Pantothenic acid	mg	10,5	10

Lean met percentage

Growers & finishers

- Improvement of lean meat percentage
  - Ensure optimal SID Lys/NE ratio's in the diets

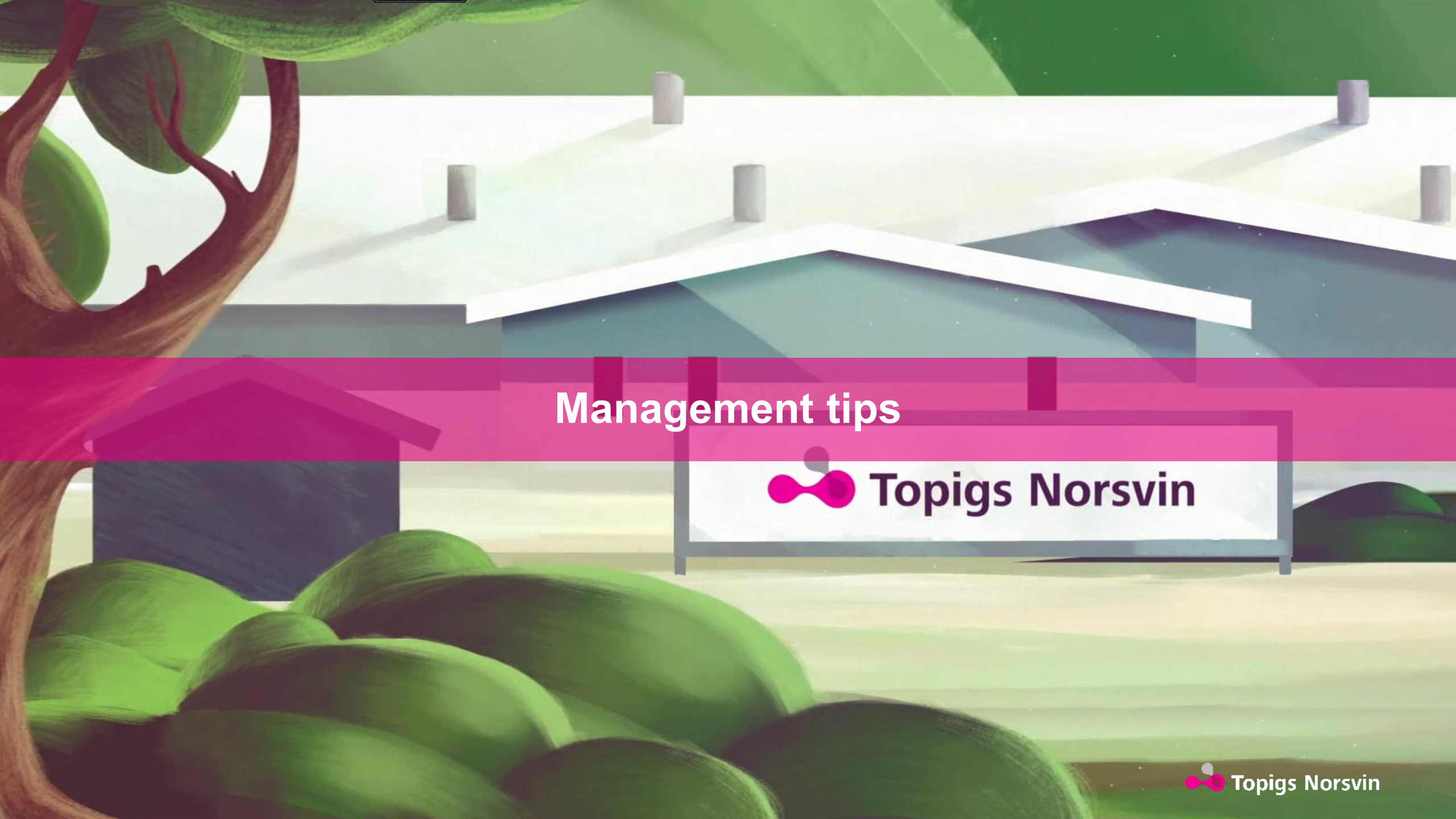
    Nursery → here you develop the muscle

    Finishing

  - Optimize amino acid balance

  - Split sex feeding with different feed curves for different sexes

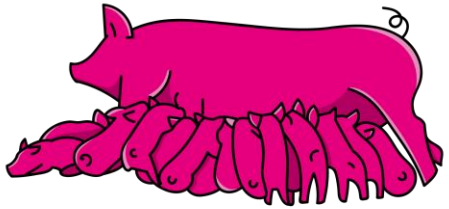
  - Optimize slaughter weights



Management tips

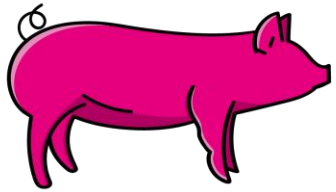
Management tips

It all begins at the start



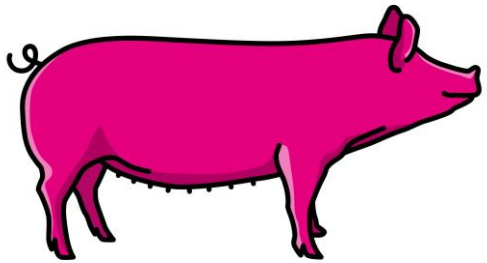
Farrowing

- Factors improving weaning weight:
  - Colostrum intake
  - Creep feed intake
  - Improve birth weight



Nursery

- Clean and warm environment at weaning
- Provide creep feed for a few days after weaning
- Sufficient water to promote water intake
- Day-night rhythm
- Avoid stress



Finishing

- Split sex feeding
- Optimal climate
- Stocking density
  - Drinker:pig ratio
  - Feeder:pig ratio

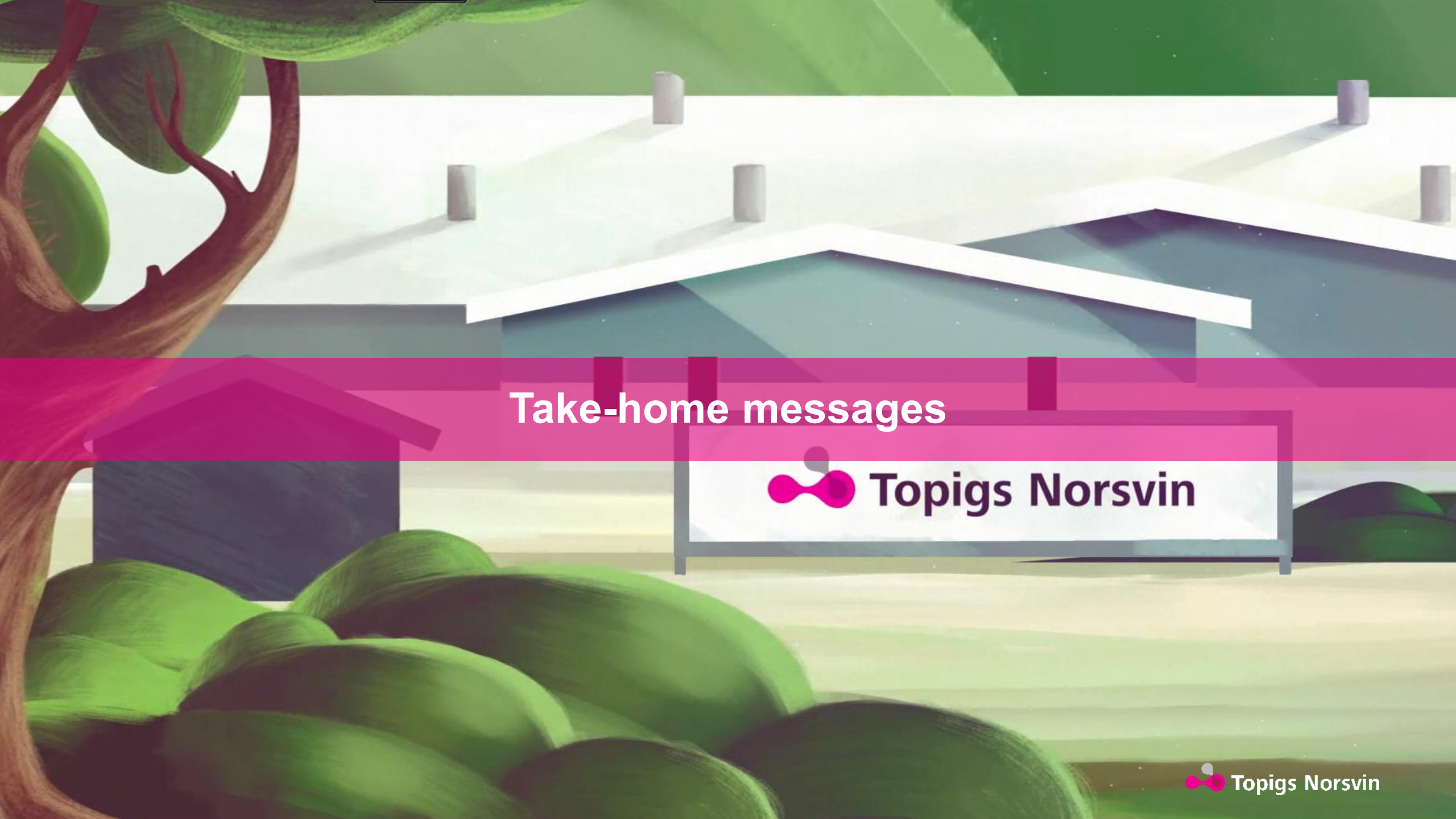
Topigs Norsvin

Management tips

- System hygiene
  - Liquid feeding!
  - Clean pipes and system regularly

- Check ventilation settings
  - Modern genetics grow faster nowadays

Take-home messages



Take-home messages

Manual is based on achieving genetic potential.

It starts already in the farrowing room.

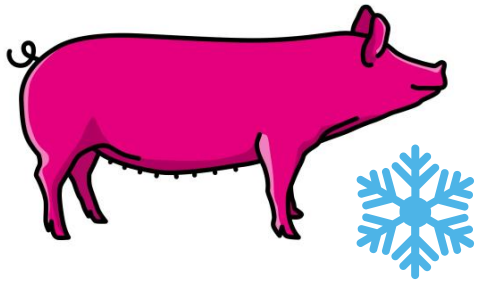
Optimize diets in terms of energy, SID Lysine, amino acid profile, vitamins and minerals.

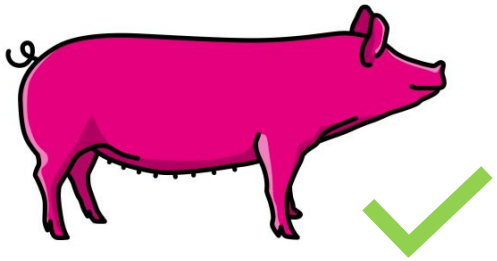
PROGRESS IN PIGS. EVERY DAY

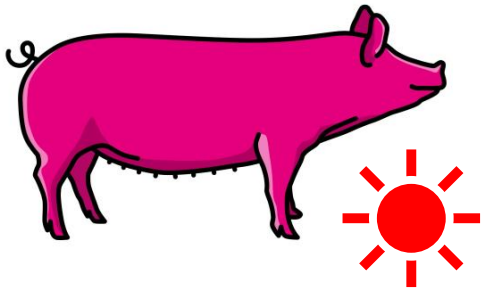
Topigs Norsvin

Question from audience

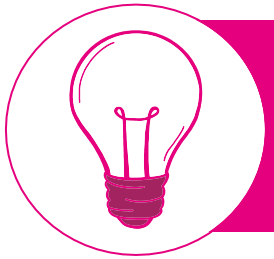
What is the ideal temperature for finishing pigs and when are pigs using their body energy reserves?







Cold stress	Ideal temperature	Heat stress
<18 °C	18 – 21 °C	>21 °C



TN Duroc progeny are high-performing animals with high feed intake levels.
They will have an increased body heat production.
Stocking density is also important in this case.