



NURSING SOW NUTRITION.

LACTATION IS SUCH A CRUCIAL CORNERSTONE OF
SOW PRODUCTION AND REPRODUCTIVE EFFICIENCY



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Montichiari (Italy) , March 27 – 2.014





THANK YOU FOR INVITE ME .



THANKS :

- Board of SIPAS
- Scientific Committee
- Organization Committee
- Dr. Gianpietro Sandri
- Miss. Giorgina Montanari
- Sponsors
- Italian Pigs Veterinary Colleagues
- All of participants
- Secretary Team



GENETIC EVOLUTION ON SOWS



◊ SOWS Today :

- Increase total piglets born
- Better feed efficiency
- Low back fat level
- Increase milk production
- Better puberty at low age
- More growing between parities

◊ WITHOUT APPETITE

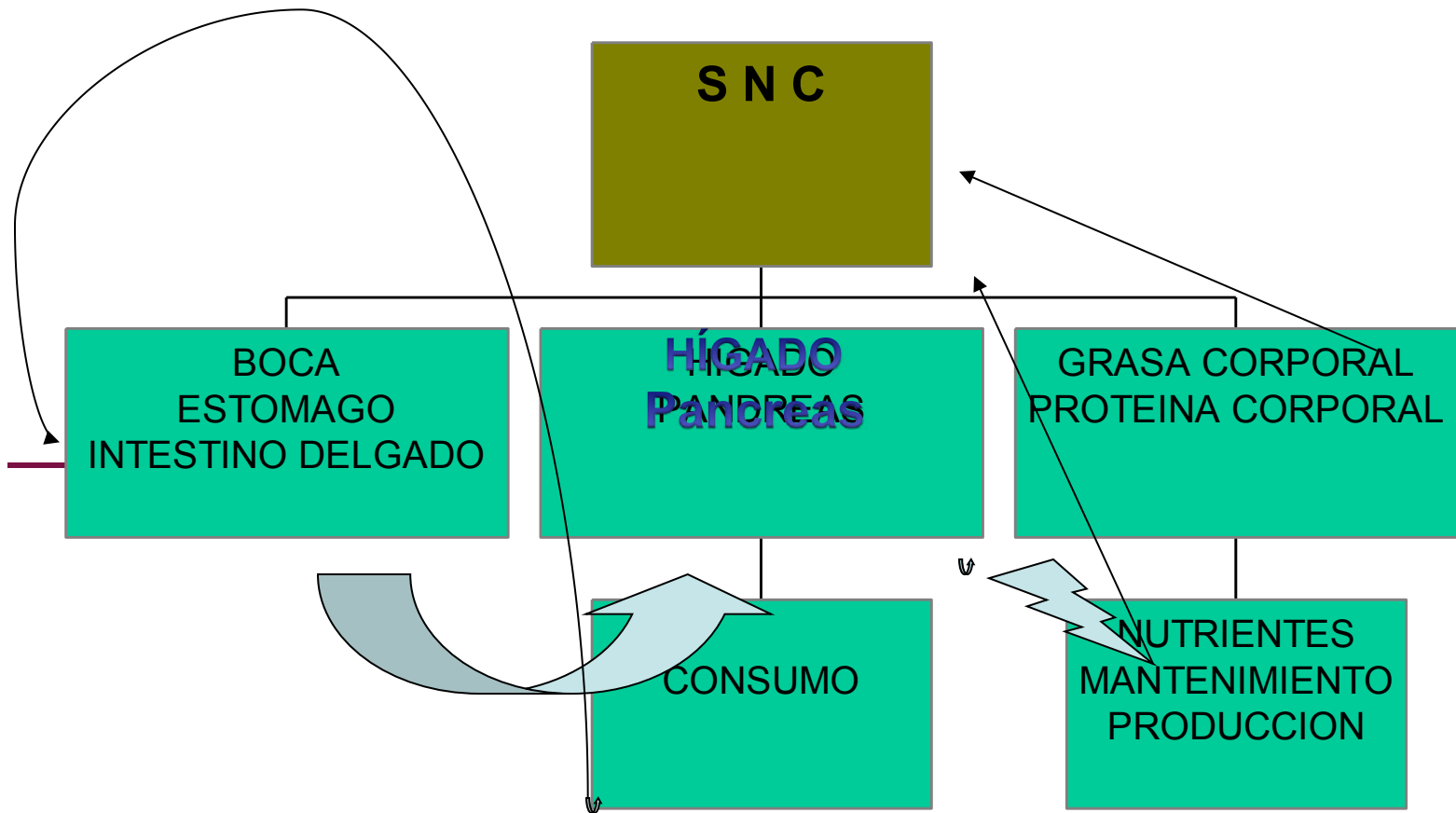
- Voluntary FEED INTAKE





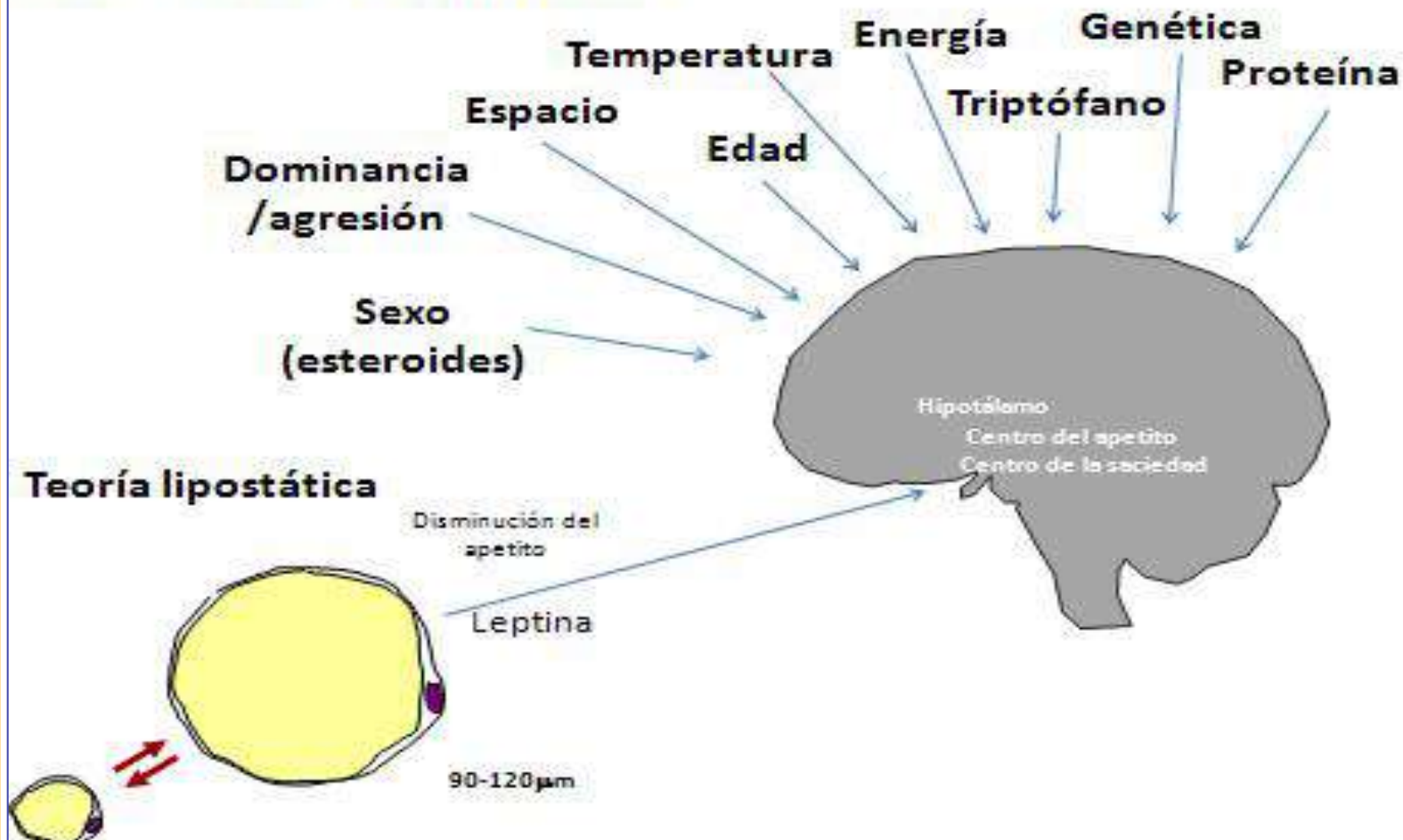
VOLUNTARY FEED INTAKE : PIGS .

INTERRELATIONSHIP BETWEEN FEED INTAKE AND LACTATING SOW PERFORMANCE ?





INGESTIÓN VOLUNTARIA





FEED INTAKE



GASTRIMARGIA

reference to GULA -

“ stomach fully “
(Locura del vientre)

Aristóteles





FEED INTAKE : Makers

- ◊ Feeding during previous gestation
- ◊ Parities : number
- ◊ PEOPLE : human beings
- ◊ Body condition at farrowing
 - Nutrients intake during gestation (energy)
- ◊ Ambient temperature : high > 22°C
- ◊ Water : quality and quantity
- ◊ Feed management and presentation
 - Pellets – meal – liquid – soup
 - Volumetric measurements - Feed density
- ◊ Feed quality and palatability
 - *High taste sensitive* .



Sensibility to Flavours and Aroma

	Olfactory Epithelium (cm ²)	Sense of Smell Neurons (x10 ⁶)	Gustatory Papillas
PIGS 	288	576	20000
DOGS 	139	278	1700
HUMAN 	5	10-20	7000

Nutriad , 2013





HIGH MILK PRODUCTION .

- INCREASE OVER TEN YEARS AGO
- INCREASE 200% ON 30 YEARS (Etienne , 2000)
- DAY/SOW PRODUCTION → 10,7 Kg/day + 0,75 kg/day for each piglet more (Thi Theu NGO ,2012)
- AVERAGE MILK CONSUMPTION BY PIGLET= 985 g.
- More than 12 piglets → reduce piglet milk intake by day
- Lineal increase between 6 -12 piglets
- Milk production by cycles : 1° - 2° < 4° - 5°
- Average daily gain by piglet in lactation = 256 g .
- Average daily gain by total piglets lactation = 2.790 g .
- CALOSTRUM PRODUCTION* =4,75 Kg (0,65-9,42)

FARM , GENETIC , NUMBER OF PIGLETS (DECLERCK , L , ESPHM Mayo 2013)





WHAT DO YOU PREFER ?

Q : ¿ 30 PIGLETS WITH 6 KG or 25 PIGLETS WITH 7 KG !

A : 30 PIGLETS WITH 7 KILOGRAMS.



- Porquet – Vic y Medina de Rioseco (Valladolid
- OLD TRUCK with 100 years to 30 PIGLETS 1 @





SUBJECT

TOTAL PIGLET BORN



WEIGHT AT WEANING





SUBJECT



MAMMARY DEVELOPMENT

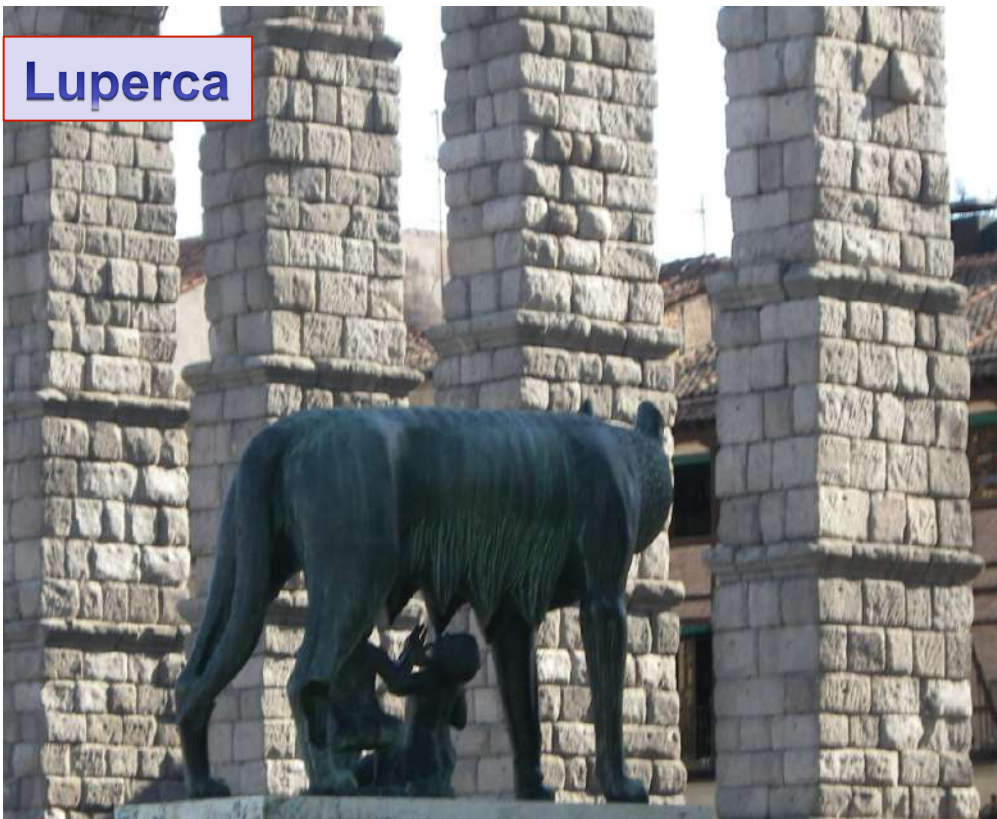
**PIGLETS
HOMOGENEITY**





NURSING SOW NUTRITION

Luperca





RELATION COST BETWEEN PRODUCTION PHASES (% €)



70G/30L



 **SOWS 15 %**
(275-300 €/YEAR)

 **PIGLET 15 %**
(12-14 €/PIGLET)

 **FATTENING 70 %**
(55-65 €/PIG)

Setna , 2013





MEDIUM WEIGHT PIGLET AT WEANING (Kg)	TOTAL WEIGHT PIGLETS SOW YEAR (Kg)	FEED EFFICIENCY (KG FEED SOW/ KG PIGLET WEANING)
5,00	122,50	9,26
5,50	134,75	8,42
5,75	140,87	6,05
6,00	147,00	7,71
6,25	153,12	7,41
6,50	159,25	7,12
6,75	165,37	6,86
7,00	171,50	6,61

**NOTE → 10 PIGLET WEANING SOW
24,5 PIGLET / SOW / YEAR
2,45 SOW PARITIES / YEAR**



MEDIUM WEIGHT PIGLETS AT WEANING (Kg)	TOTAL WEIGHT PIGLETS SOW YEAR (Kg)	FEED EFFICIENCY € (€ SOW FEED / € KG PIGLET WEANING)
5,00	122,50	2,314
5,50	134,75	2,104
5,75	140,87	2,012
6,00	147,00	1,929
6,25	153,12	1,851
6,50	159,25	1,780
6,75	165,37	1,714
7,00	171,50	1,653

**NOTE → 10 PIGLET WEANING SOW
24,5 PIGLET / SOW / YEAR
2,45 SOW PARITIES / YEAR**



SUBJECTS →

- STABLE BODY CONDITION
- NUTRITIONAL REQUIREMENTS OVER REPRODUCTION PHASES (GEST / LACT)
- REAL FEED INTAKE BY SOW / YEAR vs PRODUCTIVITY – RESIDUAL FEED INTAKE ;
- CONSIDERATIONS : GENETIC LINE, LACTATION TIME , HEALTH STATUS .
- LACTATION PHASE : METABOLIC NEGATIVE BALANCE . CRITICAL POINT .





LACTACION



! PROGESTERONA
! ESTROGENOS
+ FSH + LH
HIPERGONADOTROPICA

! PROGESTERONA
! ESTROGENOS
Supresión FSH-LH
FASE TRANSICION

DIA 2 A DIA 14

! PROGESTERONA
+ ESTROGENOS
+ FSH + LH
FASE NORMALIZACION



SUBJECT → LACTATION PHASE.

@ HIGH MILK PRODUCTION

@ BODY CONDITION AT WEANING

@ HIGH FEED AND NUTRIENTS
INTAKE DURING LACTATION .





MAMMARY GLAND DEVELOPMENT





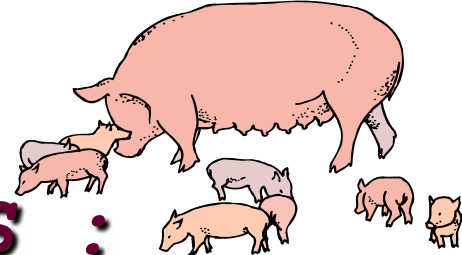
HIGHT MILK PRODUCTION

A

- ④ 10-12 Litres/Day = > 200 Litres / 21 days.
- ④ 4 milk litres → 1 Kilogram of piglet (5.400 Kcal EM - 26 grames of total lysine)
- ④ Marginal coefficient of energetic efficiency to milk production are 70 % . Each 60% of energy extra intake go directly to milk production.
- ④ Fat level feed increase → Increase milk fat content , but NO increase real milk production . iii
- ④ Dry matter (g/piglets/day) = $0,72 \times \text{ADG} - 7 \times \text{n}^\circ \text{ piglets}$
Milk production equation prediction .

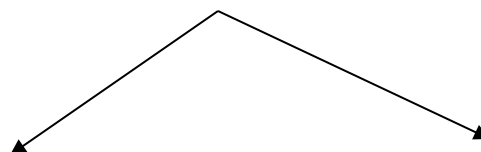
(Noblet & Etienne , 1989)





ENERGETIC REQUIREMENTS :

TOTAL ENERGY (100)
DIGESTIBLE ENERGY (96)
METABOLIZE ENERGY



MANTEINANCE PRODUCTION

Reproduction NE - 0.48

Growing Net Energy - 0.77

Lactation Net Energy - 0.72



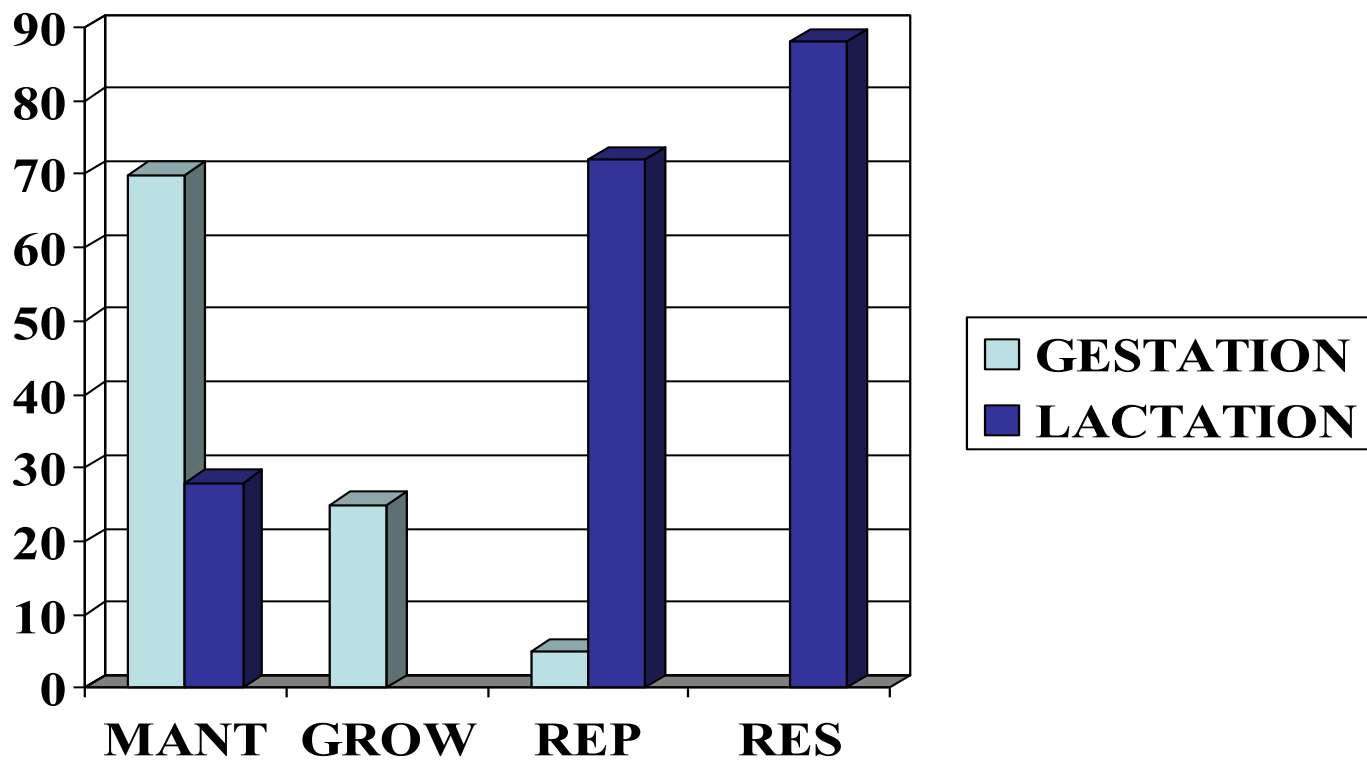
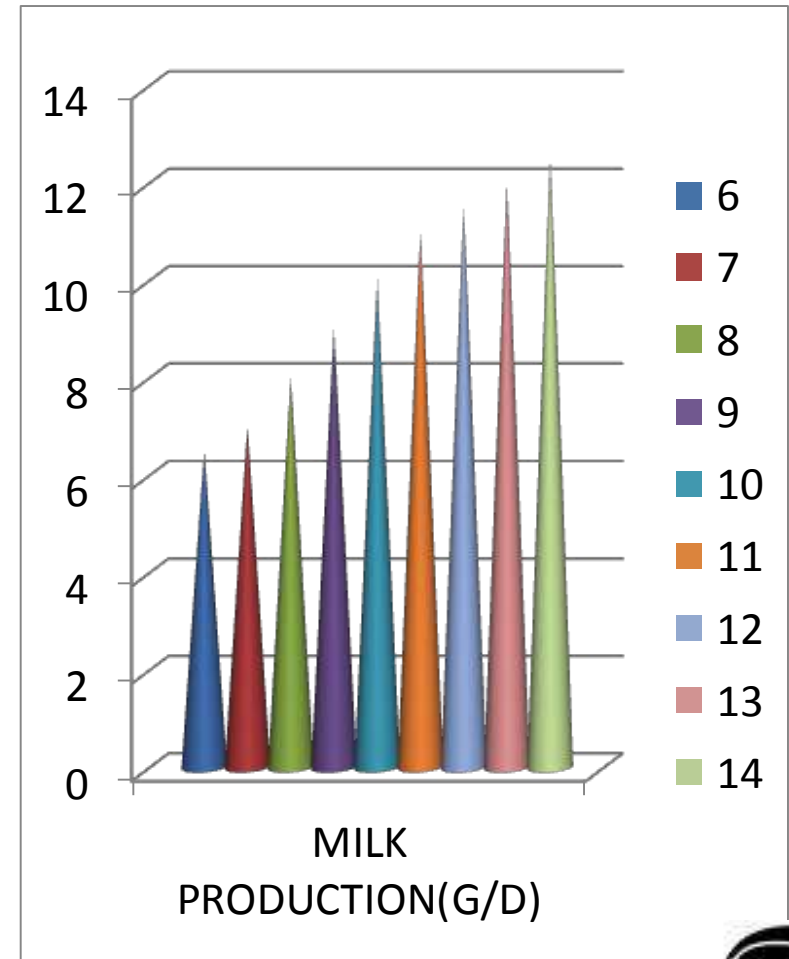
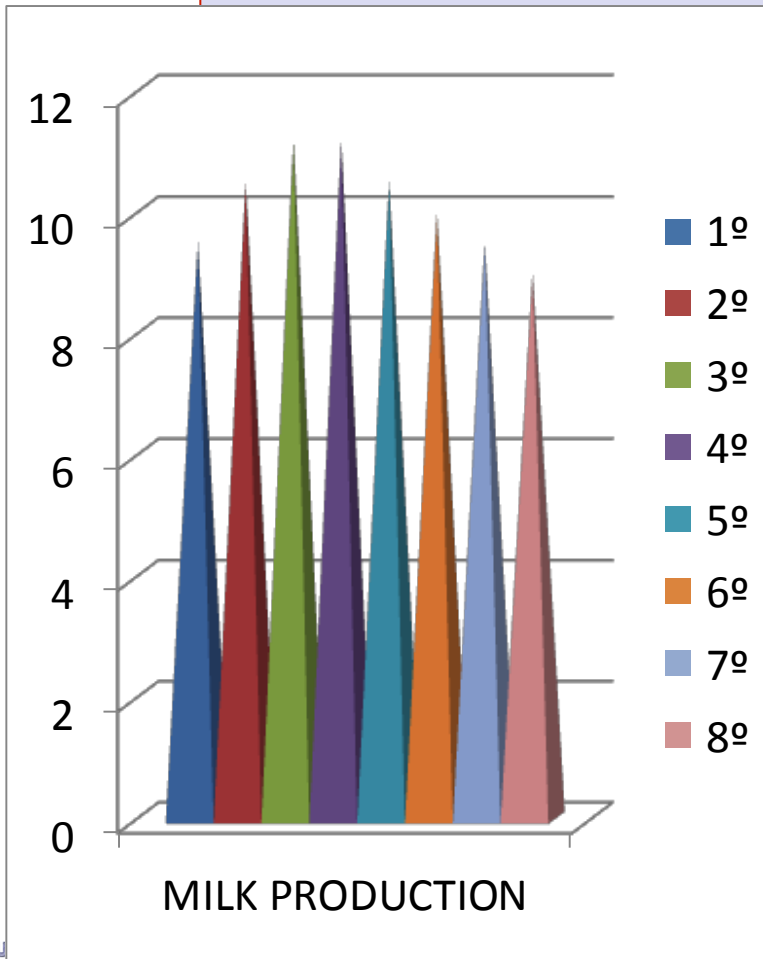




TABLE I – MILK PRODUCTION BY CYCLES
TABLE II – MILK PRODUCTION BY NUMBER OF PIGLETS





HIGH MILK PRODUCTION

A

■ INCREASE MILK PRODUCTION →

INCREASE NUTRITIONAL REQUIREMENTS .

■ HUMAN – PRODUCTION FIRST SIX MONTHS =
750 ml/day (Range over 550-1.250 ml)
= energetic requirment by mother of
85 kcal / 100 ml = 850 Kcal ED / Litre

Daily energetic requirements on human lactation =
+ 500 kcal/day over no lactation .

WATER Requirements = 2,5-3,0 Litres/Day .





MAMMARY DEVELOPMENT : Medium





MAMMARY DEVELOPMENT : BAD .





MAMMARY DEVELOPMENT : BAD .





MAMMARY DEVELOPMENT : GOOD .





MAMMARY DEVELOPMENT : GOOD .





• SOW MILK COMPOSITION →

■ DRY MATTER	18-19 %
■ WATER	80-82 % (*)
■ Crude Protein	5,0-5,5 %
■ Total Lysine	7,39 g/100 g CP
■ Total Methionine	2,00 g/100 g CP
■ Total Threonine	4,34 g/100 g CP
■ Total Fat	7,0-8,0 %
■ Total Ash	1,0 %
■ Lactose	5,0 %
■ Metabolic Energy	1.290-1.330 Kcal



■ WATER – 1ST NUTRIENT →

■ 1 MILK LITER = 2,5 – 3,0 WATER LITERS

■ INCREASE WATER INTAKE = INCREASE WEANING WEIGHT

■ Example .- Lactation 21 days :

10 x 21 = 210 Litres 52 kg piglets

11 x 21 = 231 Litres 58 kg piglets

(*) Welfare – water preference than feed by pigs .





SOW NUTRITION



LOW FEED INTAKE IN LACTATION : RESULTS .

-Catabolism :

LIPID

↓ Milk Production.
↑ Weaning to Insemination .

PROTEIN

↑ Anoestrus
↓ Fertility
↓ Embryonic Survivor

- Ovaric consequences :

↓ Follicles between 0,4-1 mm.
↑ Follicles between 1-2,9 mm.
↓ Ovulation rate .





LOW SOW FEED INTAKE IN LACTATION PERIOD .



↓ MILK PRODUCTION

↓ PIGLETS GROWING

↓ WEIGHT PIGLETS AT WEANING



LOW GROWING AFTER
WEANING AND FAST
ZOOTECNICAL PARAMETERS
ON FATTENING UNITS .



↑ LOST BODY CONDITION

↑ WEANING TO HEAT TIME

↑ ANOESTROS

↓ OVULATION RATE

↓ FERTILITY RATE



LOW PIGLETS BORN ALIVE AND
REDUCE SOW YEAR
PRODUCTIVITY ..



SUB-OPTIMAL PRODUCTIVITY AND LESS PROFITS .



- SOW LACTATION TOTAL LYISINE REQUIREMENTS →

- Maintenance : 36 mg / kg metabolic weight
- Production : 26 gr / kg over 1 kg of piglet increase
- Increase lysine intake > increase milk production
(> 70 g/day total lysine / sow – Allee,G 2007)
- Relation with lean lost → DON'T QUANTIFY iii





• SOW LACTATION REQUIREMENTS →

LITTER WEIGHT UP (Kg/D)	TOTAL LYSINE INTAKE (G/D)	DAILY FEED INTAKE -KG 5,00	5,50	6,00	6,50
2,20	59,2	1,18	1,08	0,99	0,91
2,30	61,8	1,24	1,12	1,03	0,95
2,40	64,4	1,24	1,17	1,07	0,99
2,50	67,0	1,34	1,22	1,12	1,03
2,60	69,6	1,34	1,27	1,16	1,07
2,70	72,2	1,44	1,31	1,20	1,11
2,80	74,8	1,50	1,36	1,25	1,15





- **¡ MORE FEED INTAKE ECONOMIC ¡**

■ + 1 KG/SOW/DAY → 20-25 KG FEED/SOW/LACT



■ 200-250 g. total Lysine (/25) = + 9-10 Kg Piglets

■ 25 Kg FEED = + 8-9 € y 9-10 Kg Piglet = 30-40 €

ROI
4-5 /1





MAMMARY DEVELOPMENT & MILK PRODUCTION





SPANISH FARM STUDY – 258 SOWS INVOLVE

- @ WEIGHT OF SOWS AT FARROWING ENTRY AND WEANING TIME
- @ PIGLETS WEIGHT AT BIRTH AND WEANING
- @ LEVELS OF FAT AND LEAN ON SOWS BY VETKO+
- @ INDIVIDUAL FEED INTAKE FOR SOW DAY BY DAY .

PARAMETER	DATE
AVERAGE SOW WEIGTH AT FARROWING - KG	285
AVERAGE SOW WEIGHT AT WEANING - KG	246
AVERAGE PIGLET WEIGHT AT BIRTH - KG	1,520
AVERAGE PIGLET WEIGHT AT WEANING 28 Days - KG	7,820





SPANISH FARM STUDY – 258 SOWS INVOLVE

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LOST WEIGHT DURING NURSING PERIOD	39 Kg - - 50/50	BIRTH LACTATION
DAY WEIGHT LOST	518 GRAMES	< 1.000
TOTAL DORSAL FAT LOST	4 mm	< 5
TOTAL LEAN AREA LOST	3 mm	< 4
AVERAGE DAILY GAIN PIGLET	225 GRAMES	➤200
TOTAL LYSINE INTAKE / KG PIGLET	22,6 GRAMES	
TOTAL NET ENERGY /KG PIGLET	5.200 KCAL	



SUBJECTS → LACTATION PERIOD.

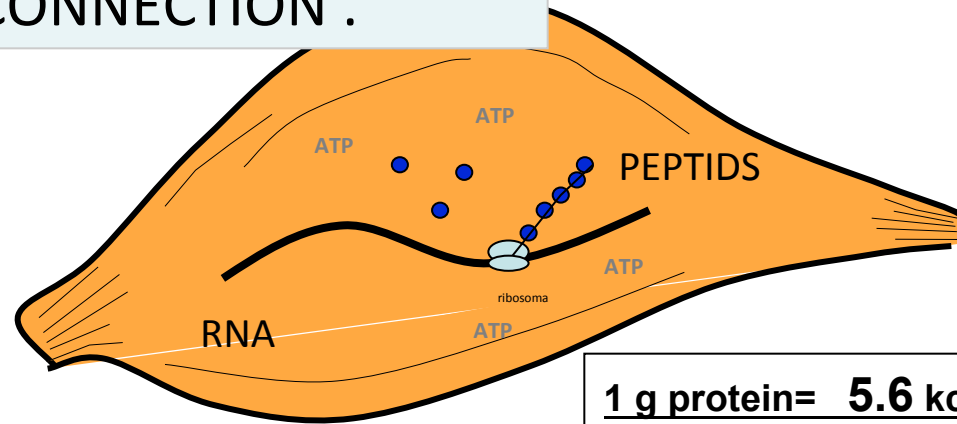
B

- @ SOW WEANING BODY CONDITION
- @ TOTAL WEIGHT SOW LOST
- @ TOTAL DORSAL FAT SOW LOST
- @ TOTAL DORSAL LEAN SOW LOST



**PROTEIN deposition require energy →
LIPID consumption .**

METABOLISM CONNECTION .



1 g protein= 5.6 kcal NE
 $5,6/0,56= 10 \text{ kcal EM}$

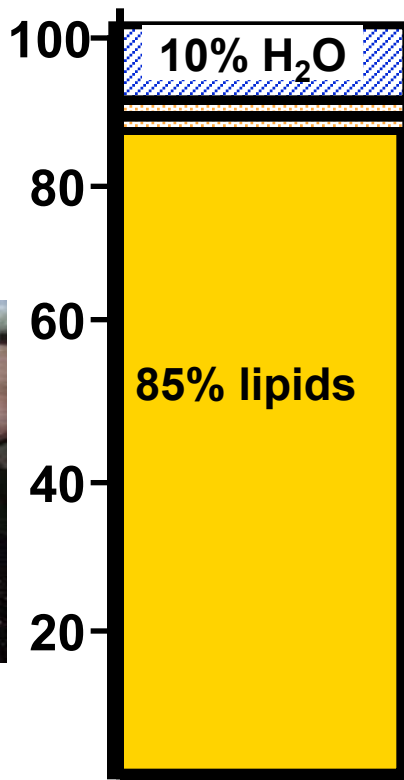
LIPIDS - CARBOHIDRATES

Adipocits

1 g lípid= 9.3 kcal NE
 $9,3/0,74=12 \text{ kcal ME}$



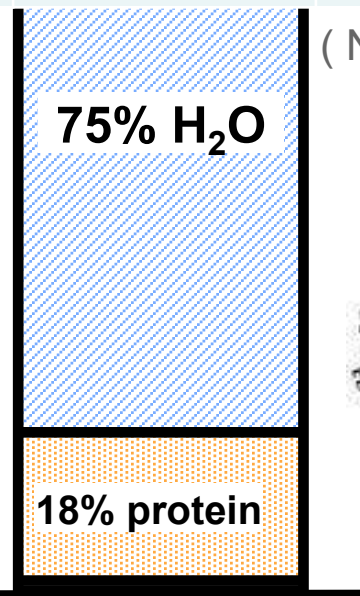
%



FAT

%	FAT	MUSCLE
WATER	18,7	69,9
PROTEIN	5,4	17,9
LIPID	75,4	10,2

(Noblet,2009)



MUSCLE



Energy.....

KJ NE/grame

8 Mcal NE/kg
31,3

1 Mcal NE/kg
8,5



FAT & MUSCLE COMPOSITION .

(López Bote , C ,2010)



@ TOTAL WEIGHT SOW LOST (20 %)

@ 10 % AT FARROWING TIME

@ 18 Kg Piglets + Placenta + Amniotic Liquid

@ < 10 % DURING LACTATION TIME

@ < 1 KG/DAY – 21 DAYS LACTATION

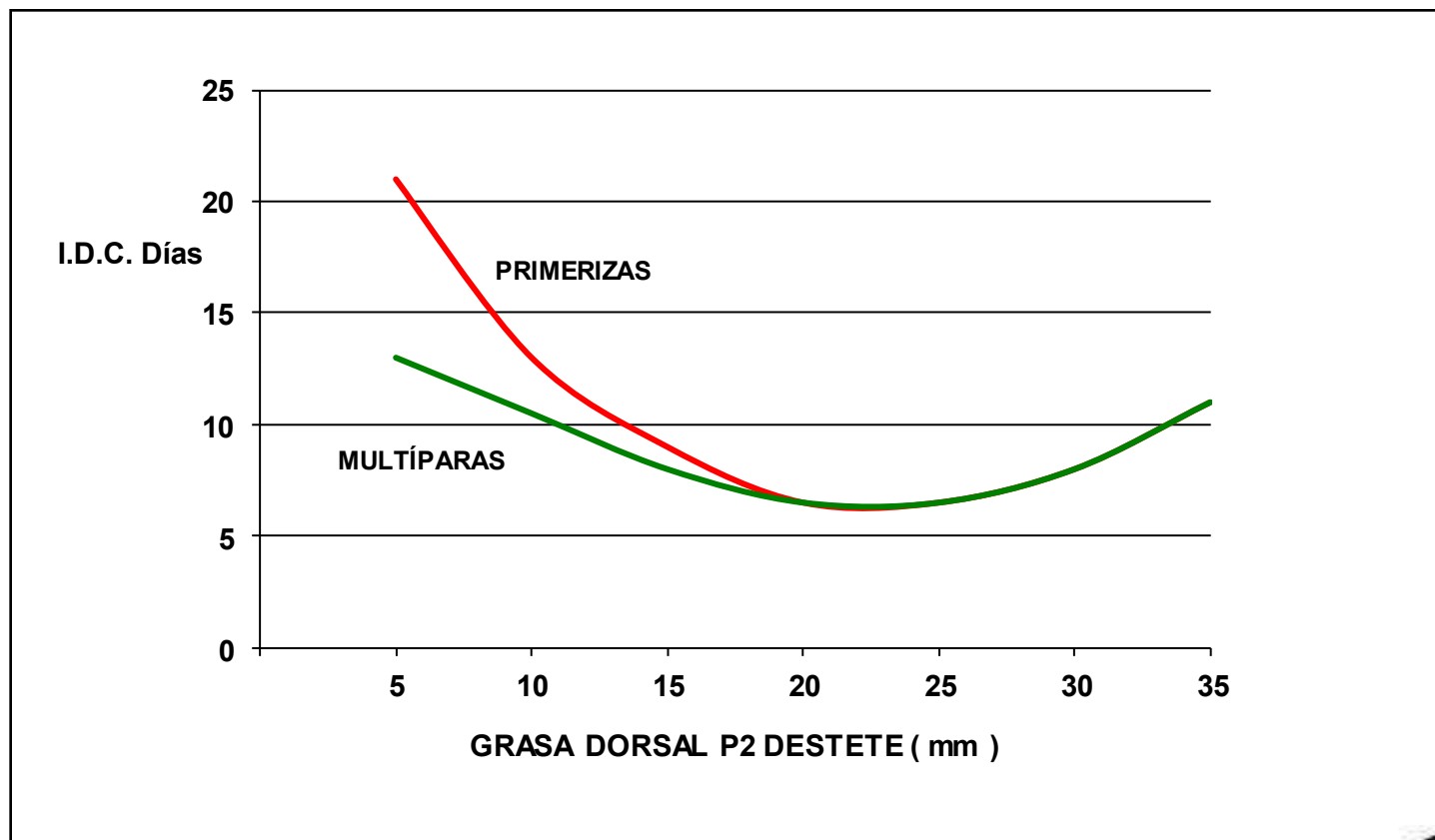


WEIGHT LACTATION LOST



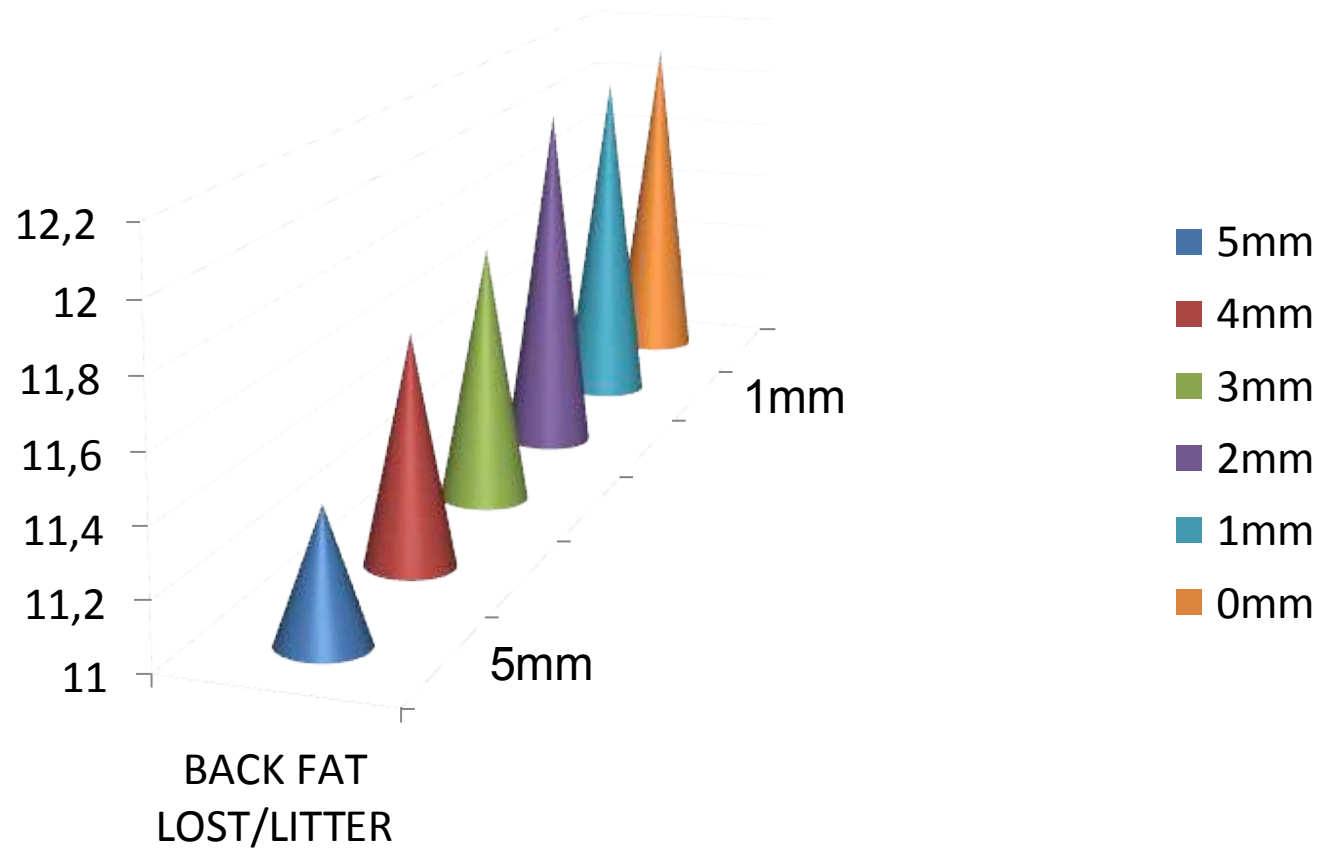


RELATION BETWEEN BACK FAT AT WEANING and WOI





RELATION BETWEEN BACK FAT LOST ON LACTATION WITH NEXT LITTER PIGLETS SIZE



Allee, G 2007





@ LEAN LOST – PROTEIN CATABOLISM



- > 9-10 % = WORSE FOLLICULAR DEVELOPMENT
REDUCE NEXT LITTER PIGLETS SIZE .

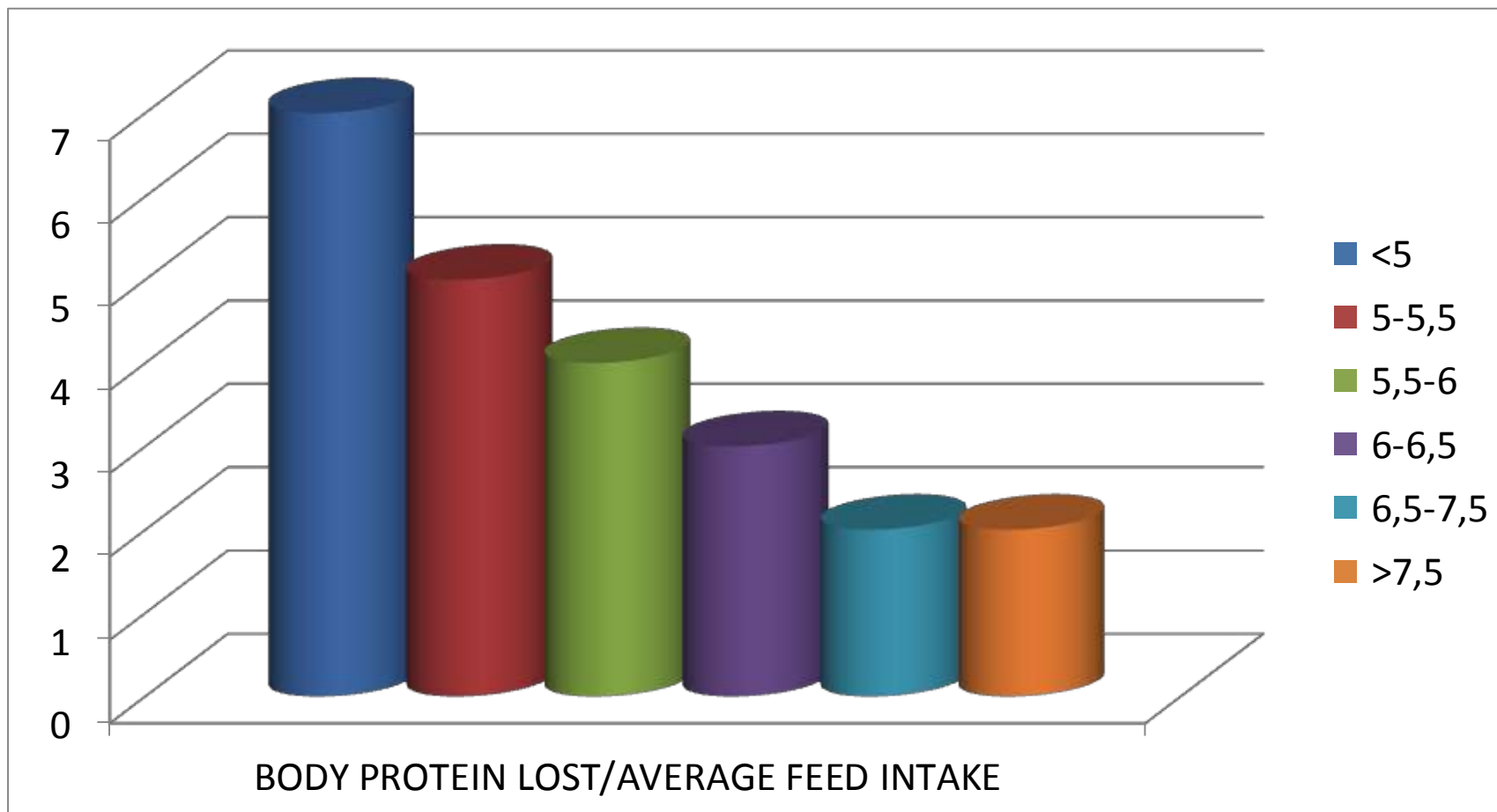
- PROTEIC MASS EQUATION (Dourmad , 1997)

$$PM = 2,28 + (0,178 \times LIFE\ WEIGHT) - (0,333 \times BACK\ FAT\ mm)$$





PORCENTUAL LOST OF BODY PROTEIN vs AVERAGE DAILY FEED LACTATION INTAKE (KG)





MAXIMIZE FEED INTAKE



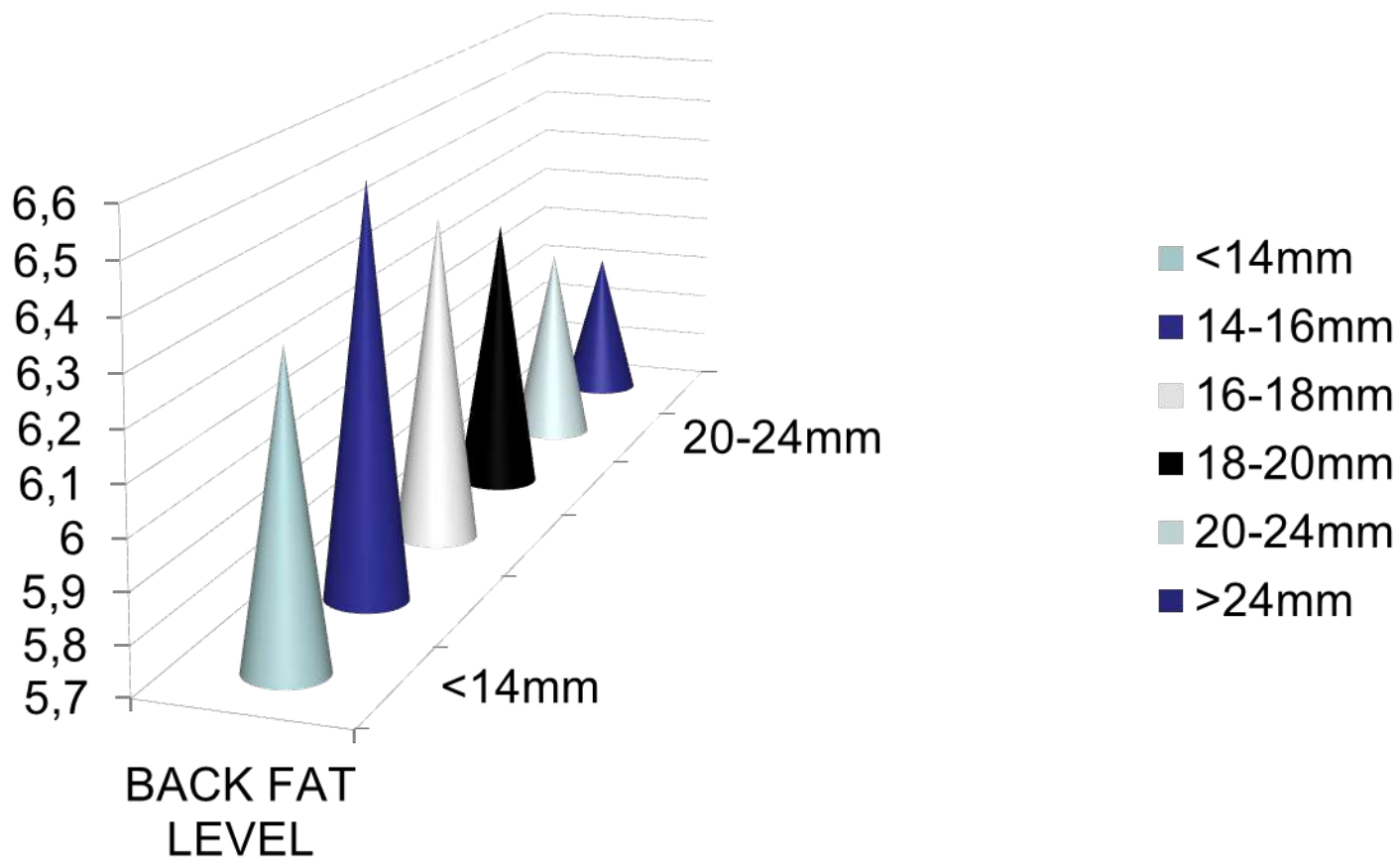
ITEMS →

- **Electrolytic Balance (200-275 mEq/kg)**
- **Glycogenic Diets**
Dextrosa – Lactosa
at 2,5 % ?
- **Fatty acids : omega 3 : fish oil , linseed oil ... ?**



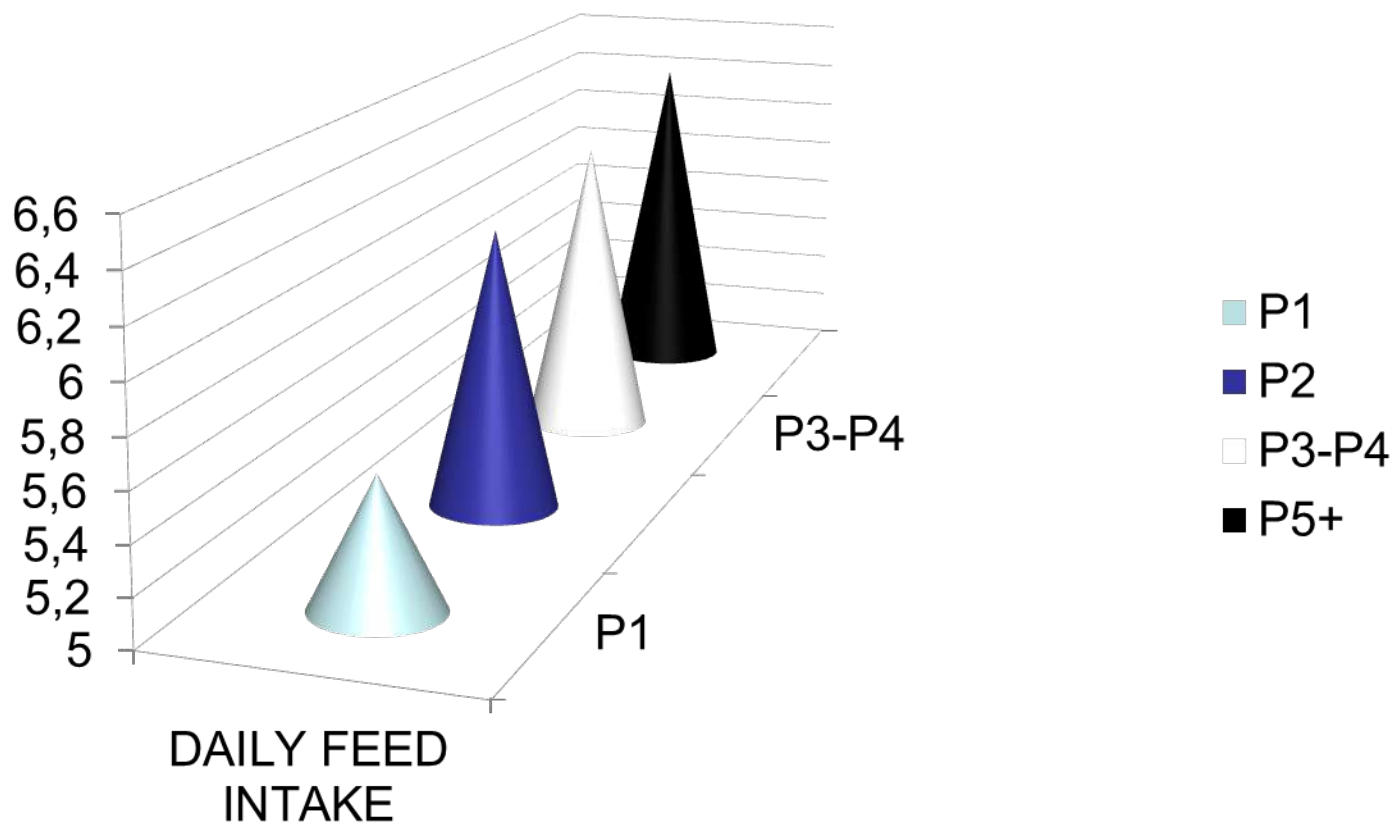


RELATION BETWEEN BACK FAT AT FARROWING AND VOLUNTARY FEED INTAKE ON LACTATION (KG)

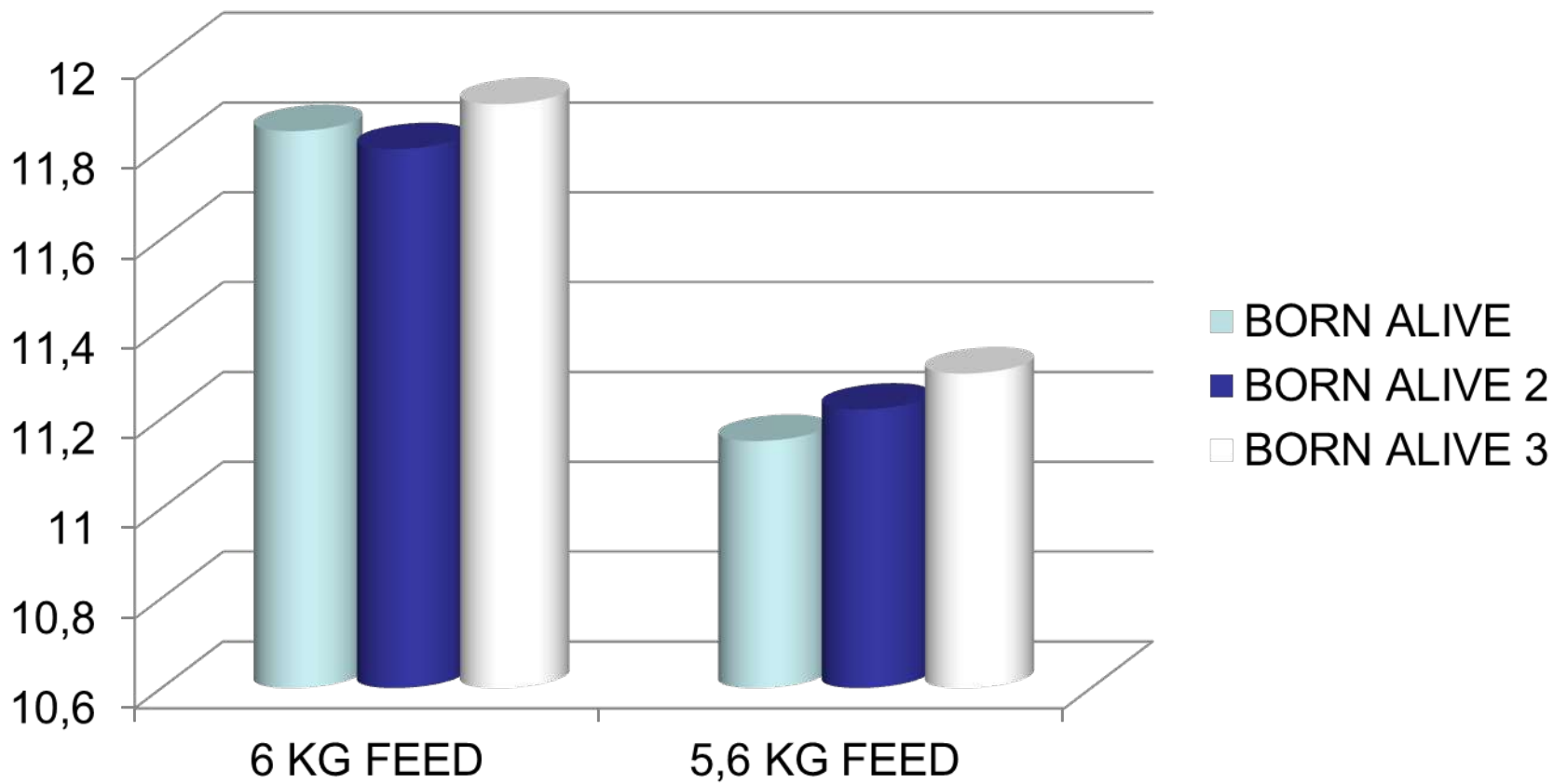


Hytek , 2008





LACTATION FEED INTAKE FOR PARITIES (KG)

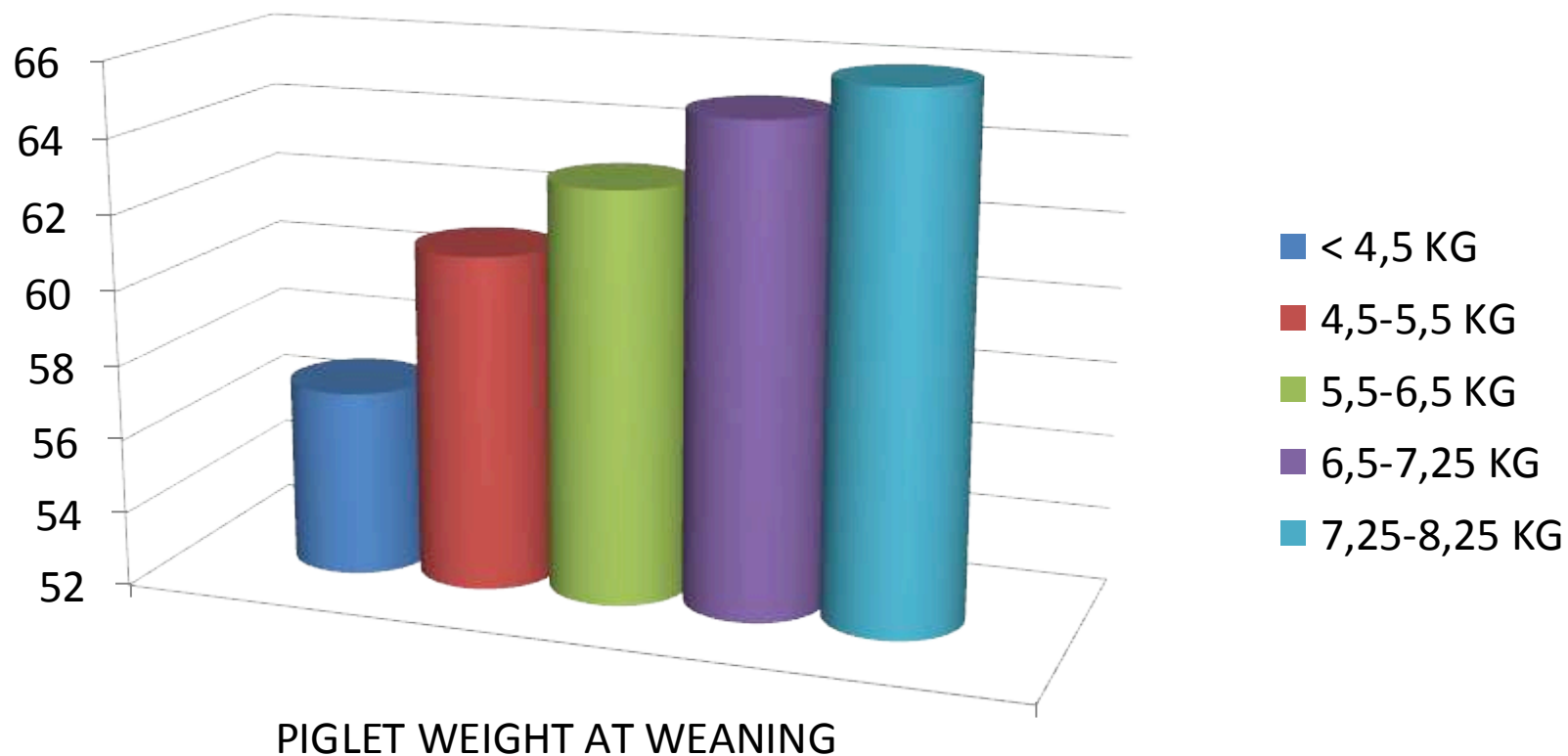


RELATION BETWEEN LACTATION FEEN INTAKE WITH PROLIFICACY
AT NEXT PARITY (Young , 2004)





RELATION BETWEEN FEED INTAKE AND TOTAL PIGLETS WEIGHT



Hytek , 2008





SUBJECTS → LACTATION PERIOD.

C

Ⓢ OPTIMAL FEED AND NUTRIENTS INTAKE BY SOW

- Ⓢ REDUCE BODY WEIGHT LOST IN MARGIN
- Ⓢ INCREASE MILK PRODUCTION
- Ⓢ INCREASE LITTER WEIGHT AT WEANING
- Ⓢ IMPROVE SOW LONGEVITY
- Ⓢ IMPROVE FUTURE FERTILITY
- Ⓢ IMPROVEMENT LITTER SIZE NEXT PARITIES .





GOOD FEED AT RIGHT TIME
ON QUALITY AND QUANTITY

FEED TO APPETITE





THANK YOU FOR LISTEN ME .



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