



UPDATE OF NUTRITIONAL REQUIREMENTS OF GOATS FOR GROWTH AND PREGNANCY IN HOT ENVIRONMENTS

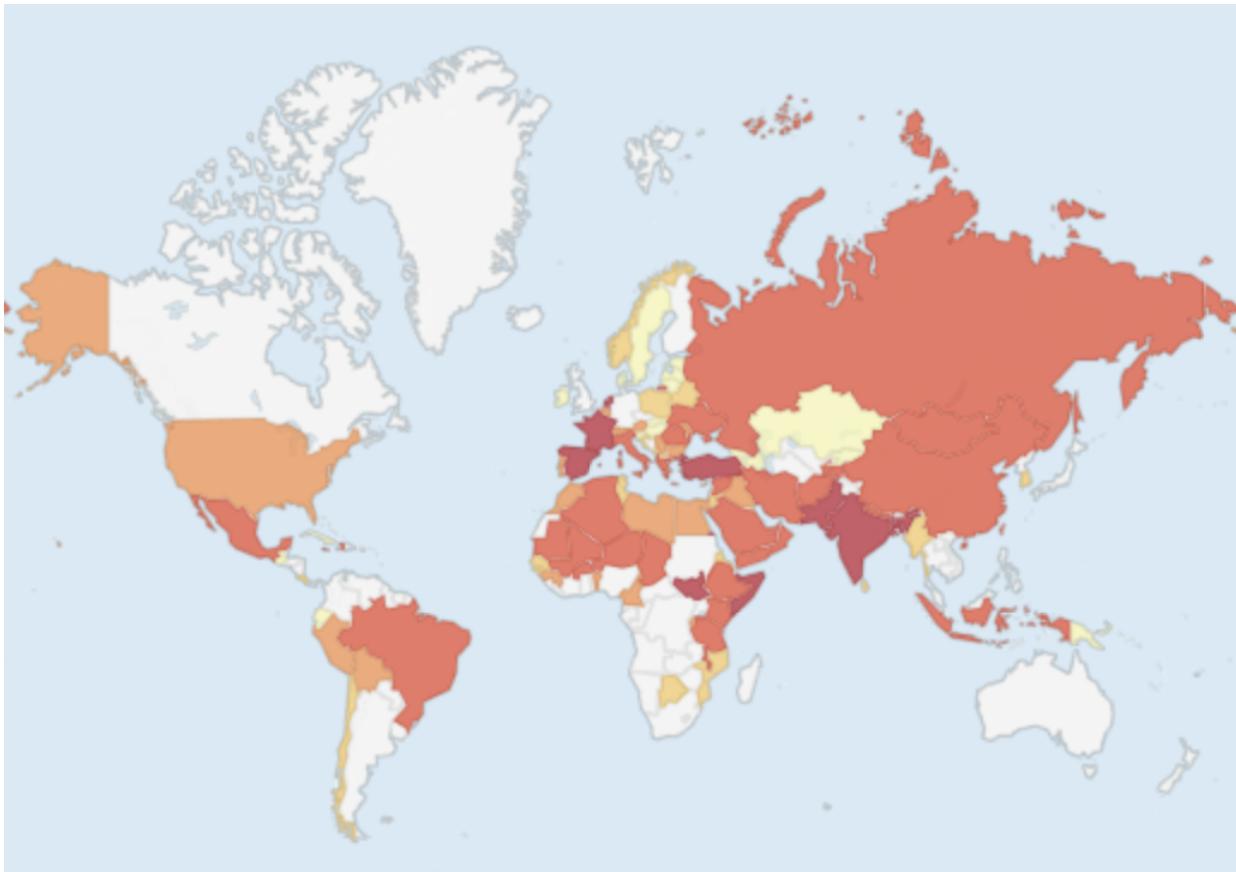
I.A.M.A. TEIXEIRA, C.J. HÄRTER, J.A.C. VARGAS, A.P. SOUZA, M.H.M.R.

FERNANDES

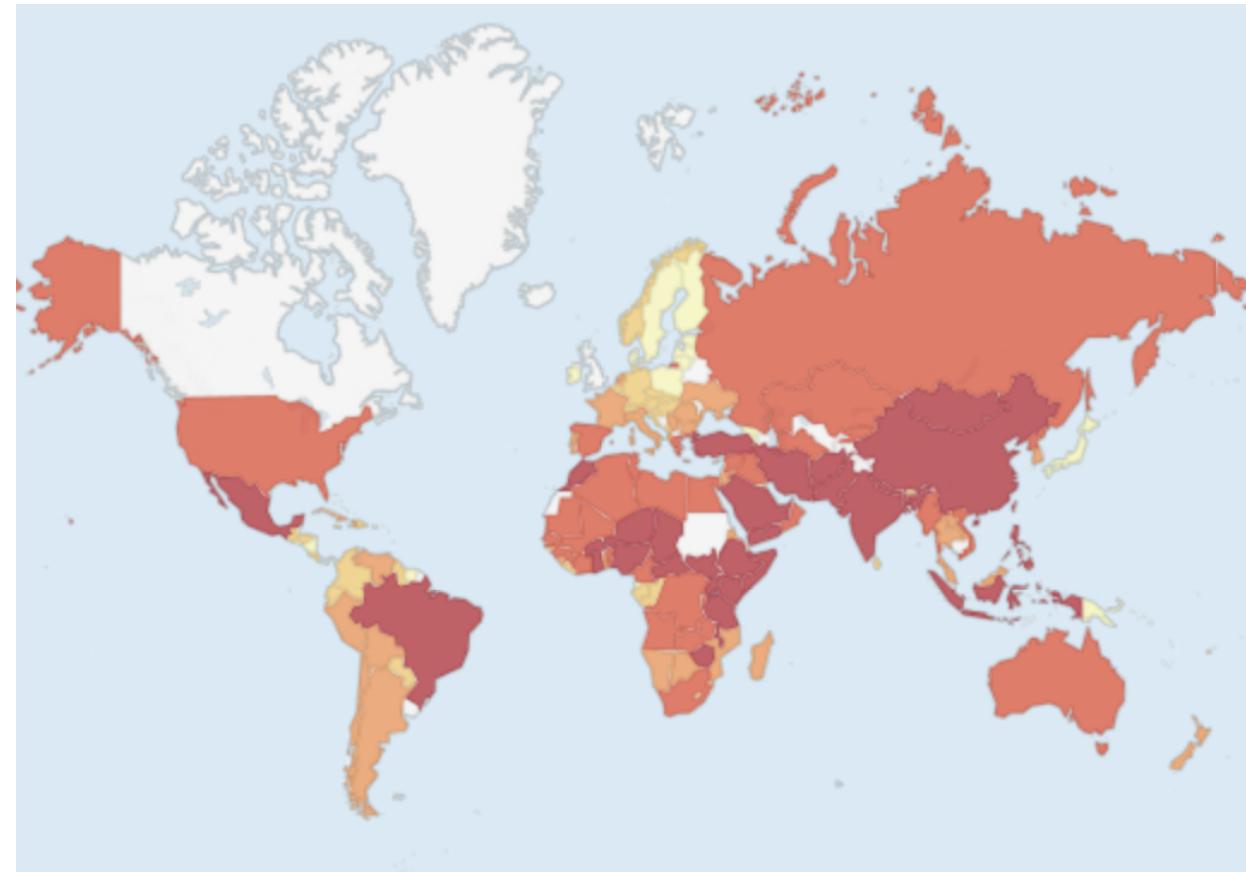
GOAT WORLD POPULATION



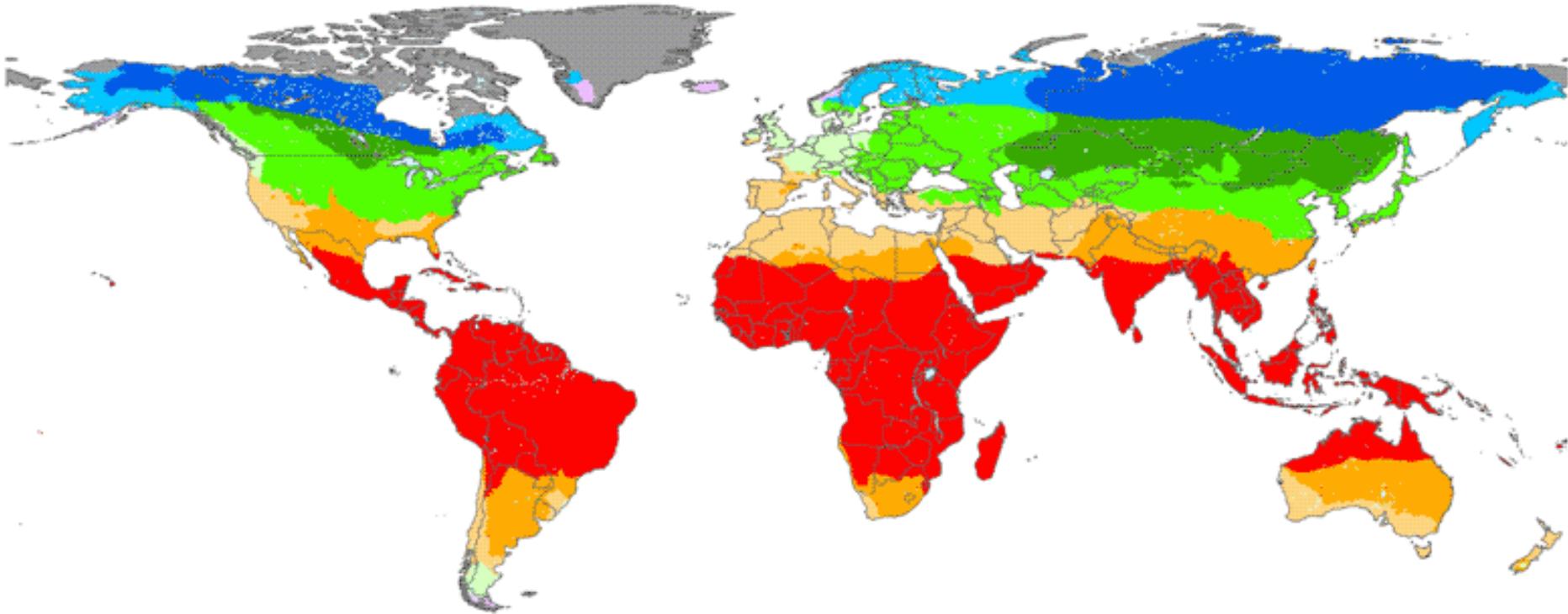
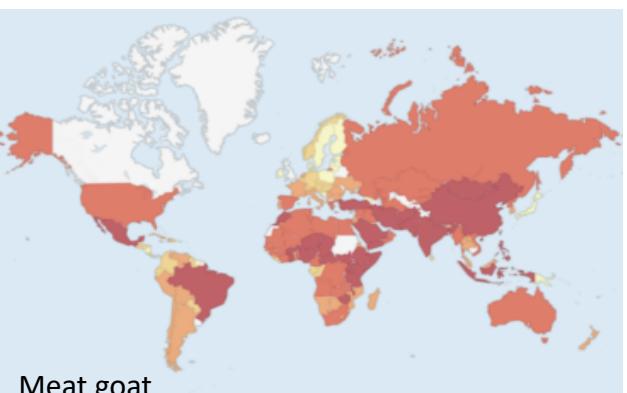
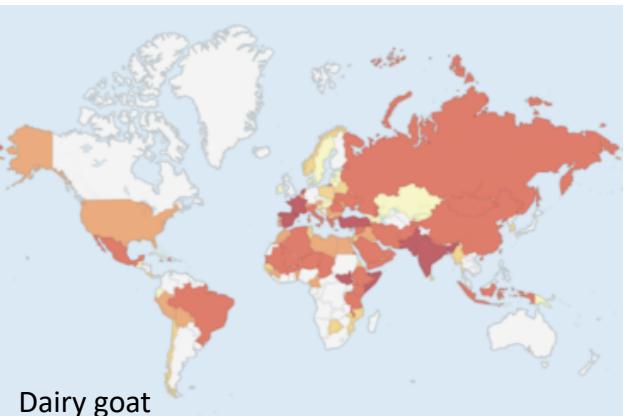
Dairy goat



Meat goat



THERMAL CLIMATE ZONES OF THE WORLD



Thermal climate zones

Tropics

Subtropics (summer rainfall)

Subtropics (winter rainfall)

Temperate (oceanic)

Temperate (sub-continental)

Temperate (continental)

Boreal (oceanic)

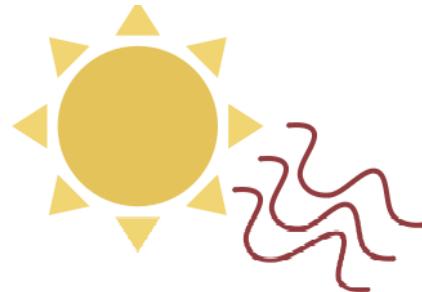
Boreal (sub-continental)

Boreal (continental)

Arctic

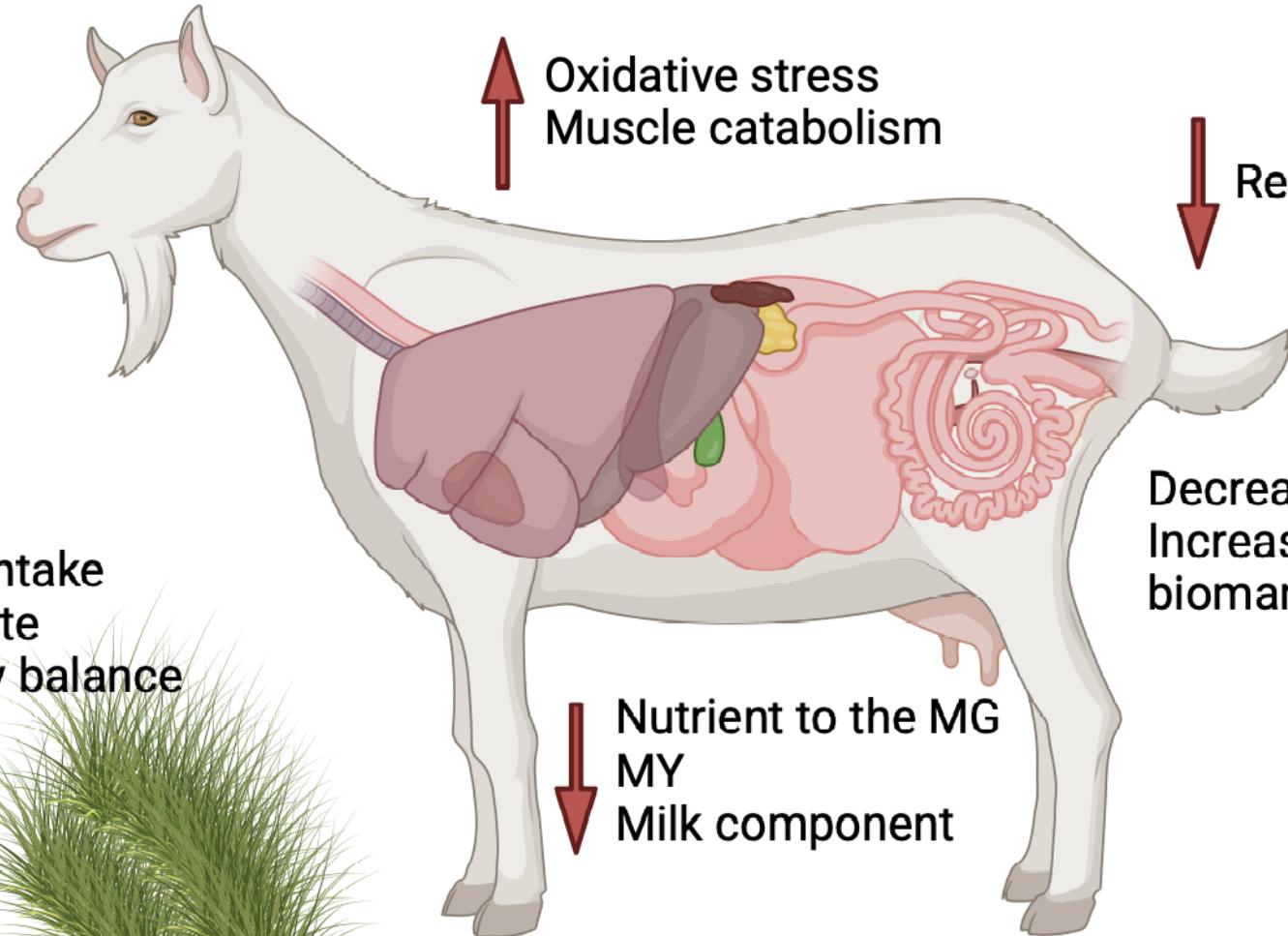
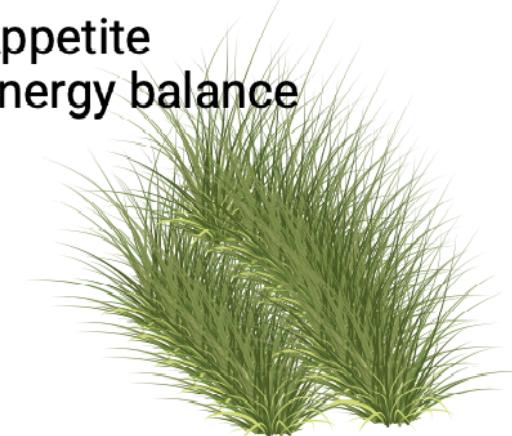
Inland water bodies

HEAT STRESS-RELATED PHYSIOLOGICAL CHANGES



↑
Body temperature
Respiration
Sweating
Maintenance costs

↓
Feed intake
Appetite
Energy balance



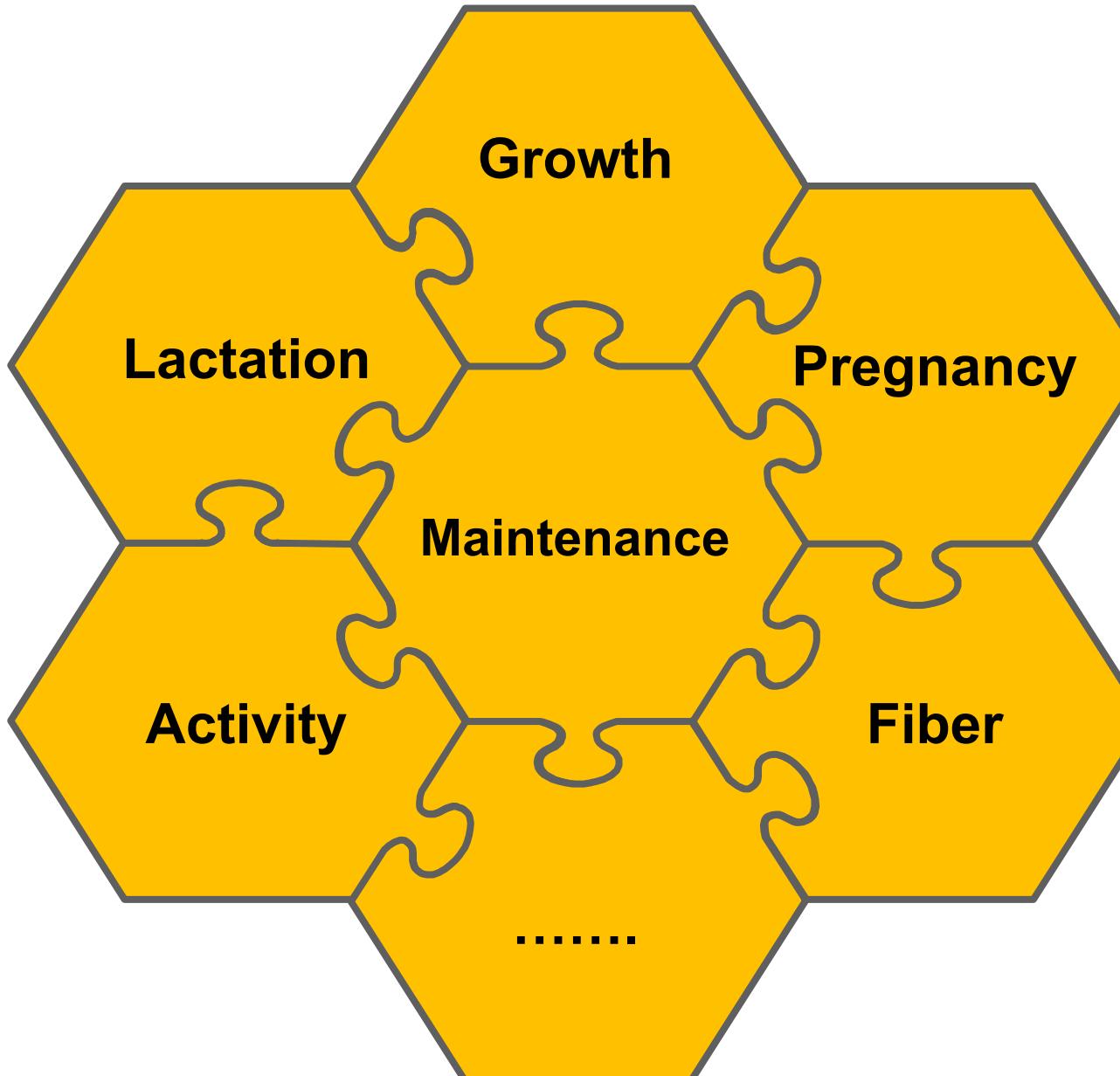
Oxidative stress
Muscle catabolism

Reproductive efficiency

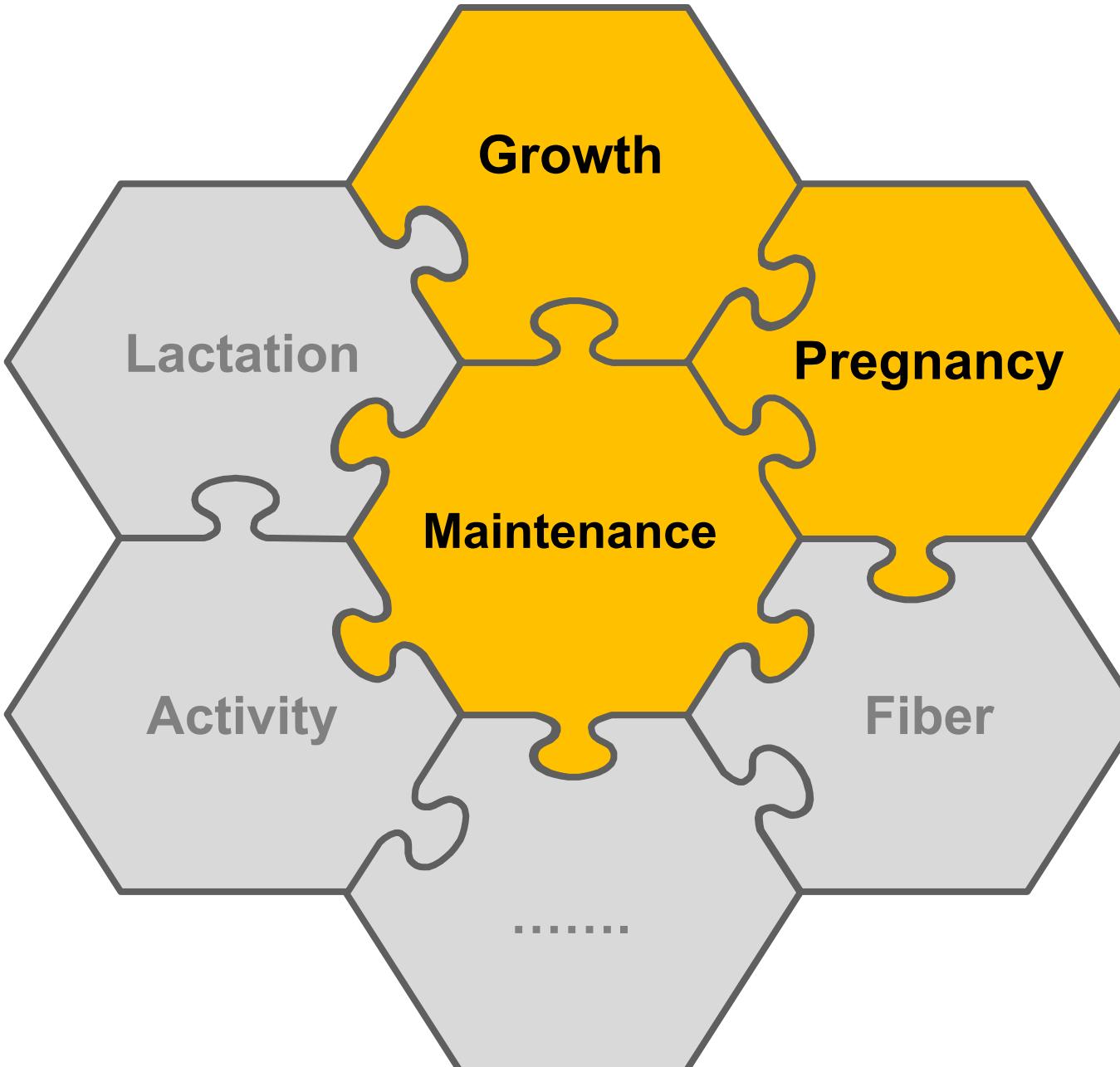
Decreased immunity
Increased inflammatory
biomarkers

Nutrient to the MG
MY
Milk component

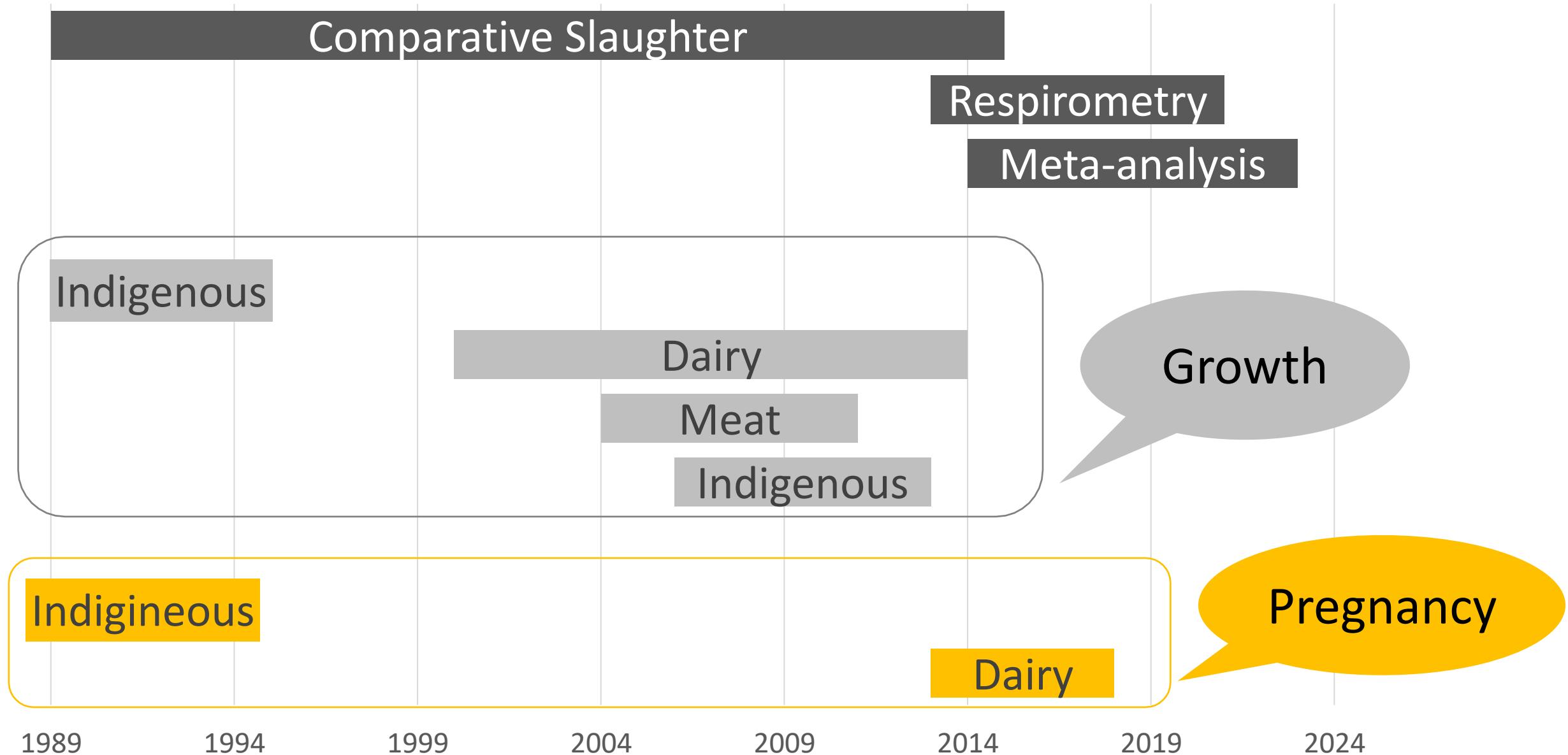
FACTORIAL APPROACH

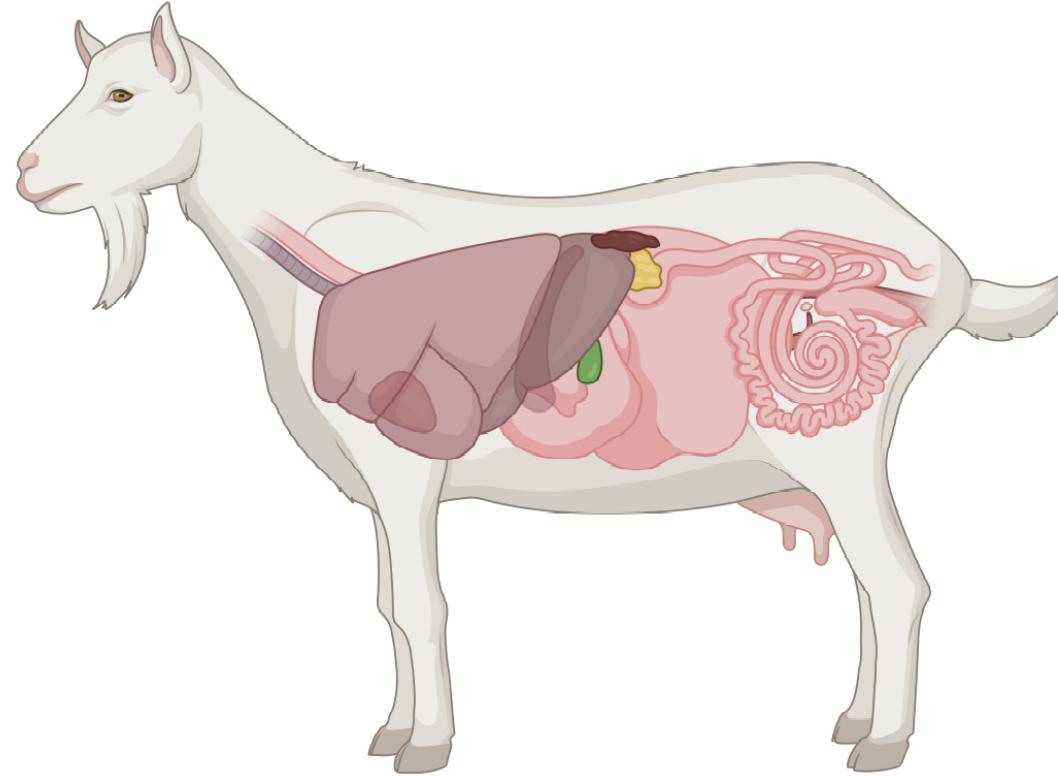


FACTORIAL APPROACH



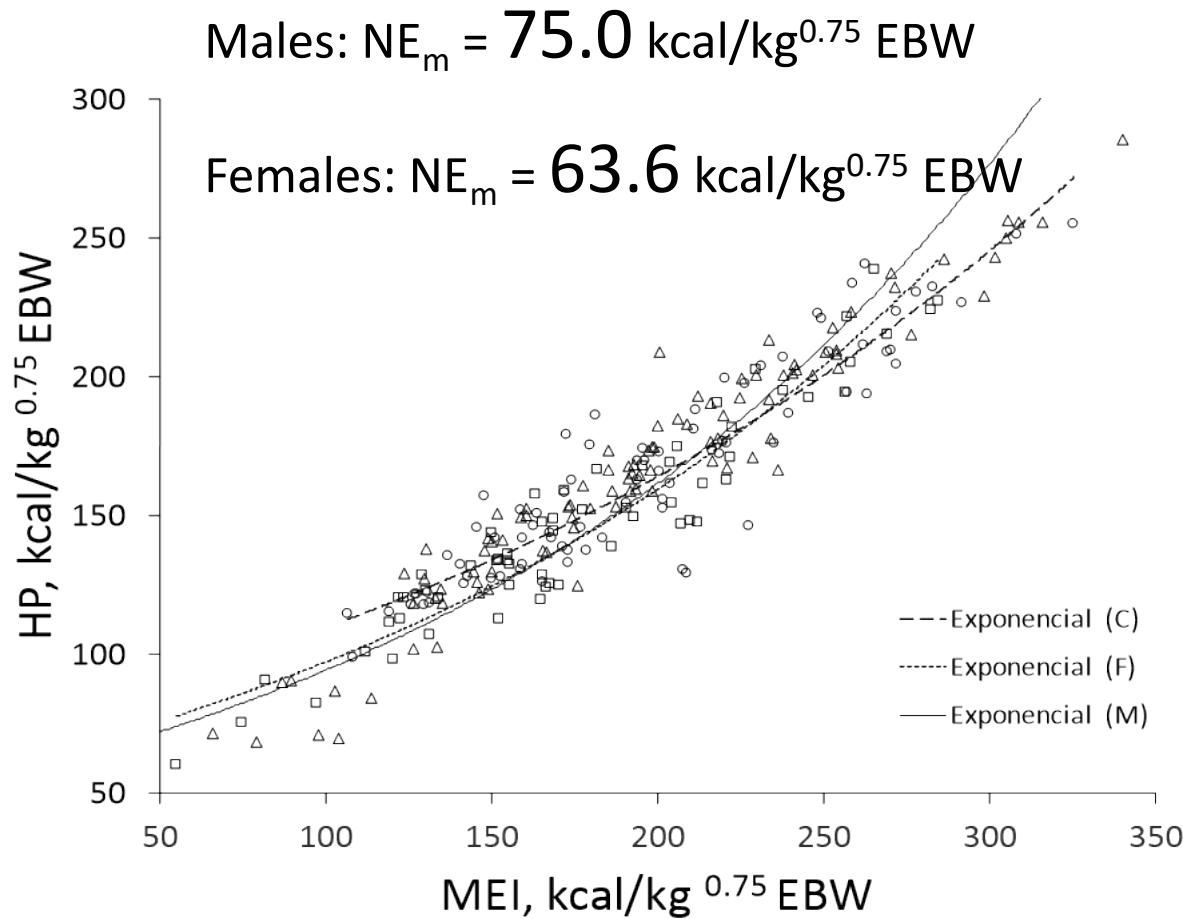
Timeline illustrating experiments conducted to estimate goats' requirements in Brazil



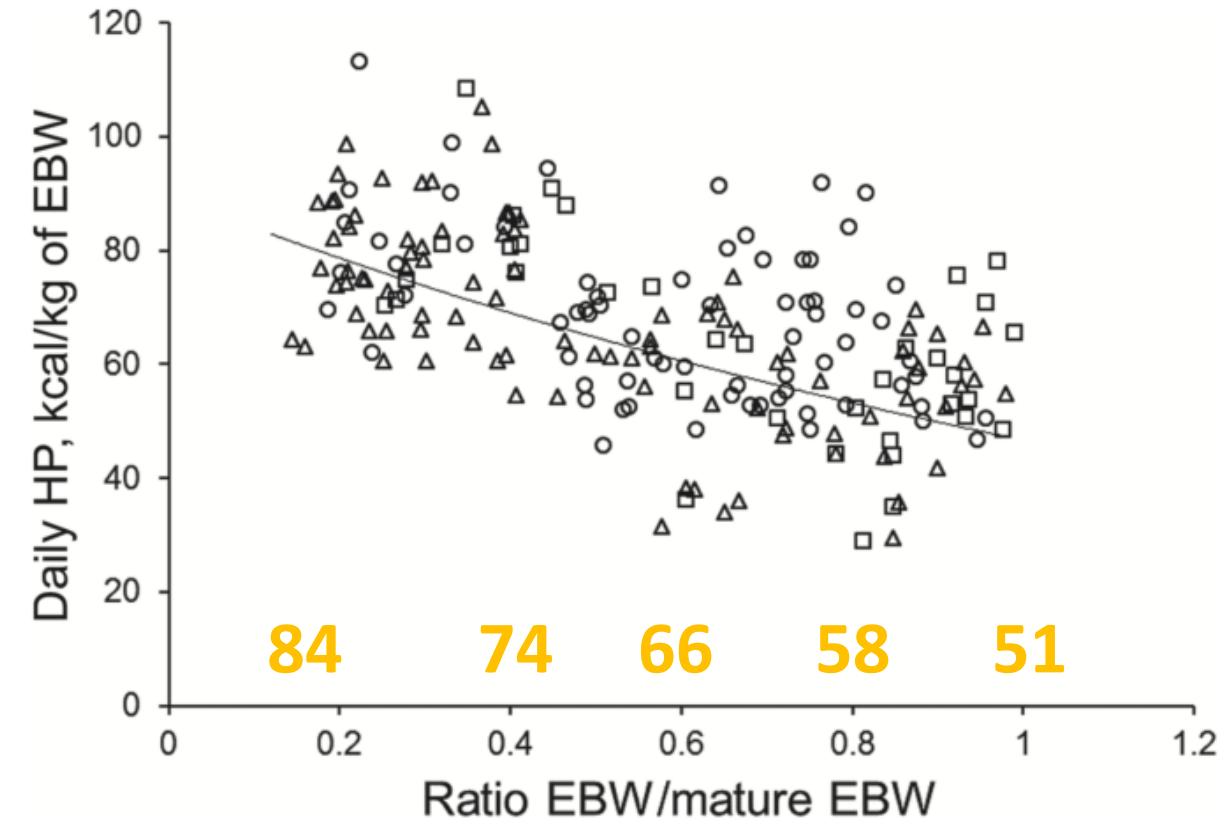


REQUIREMENTS FOR MAINTENANCE

MAINTENANCE REQUIREMENTS – SEX EFFECT



$$k_m = 0.63$$

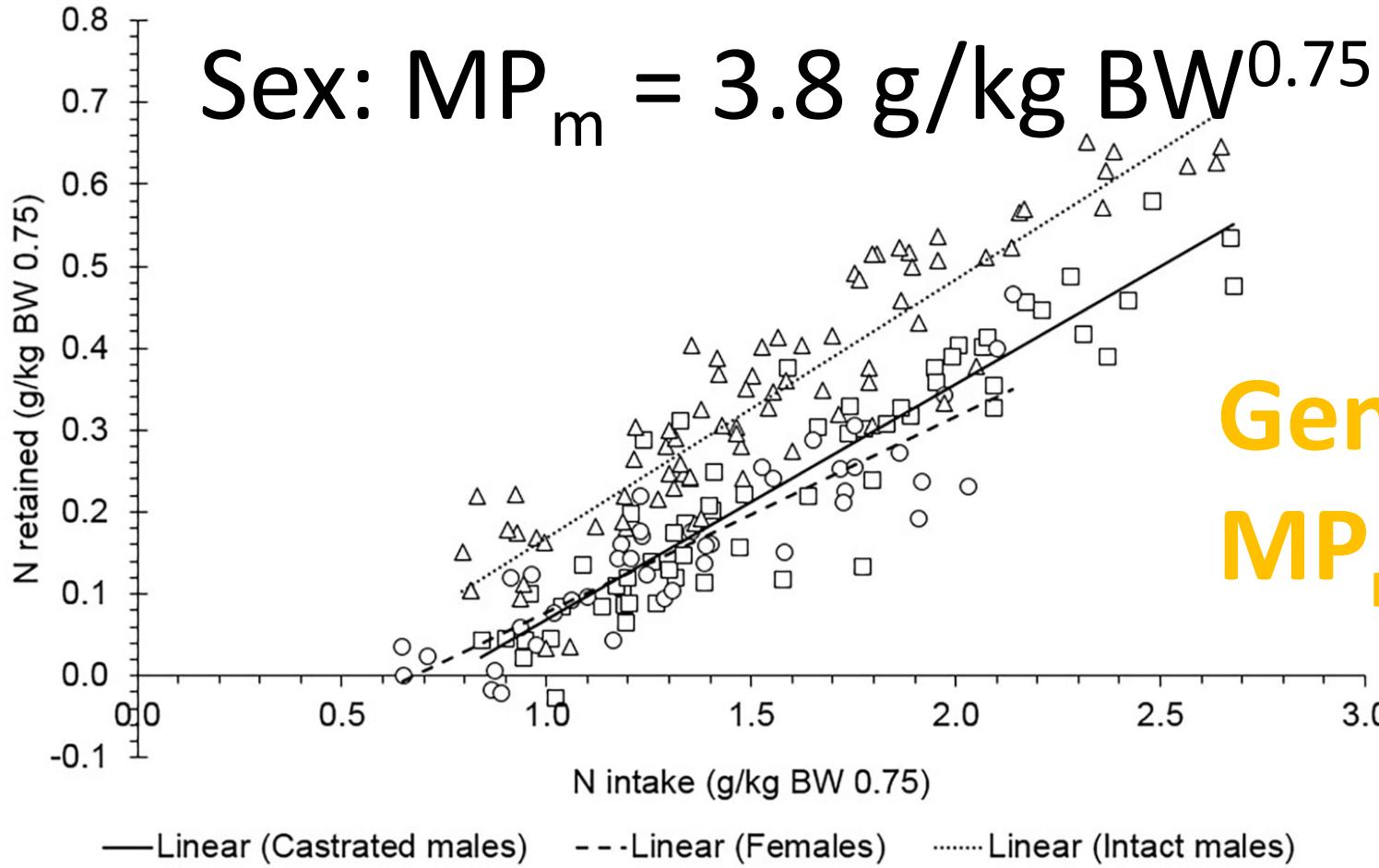


NEm and MEm – genotype effect



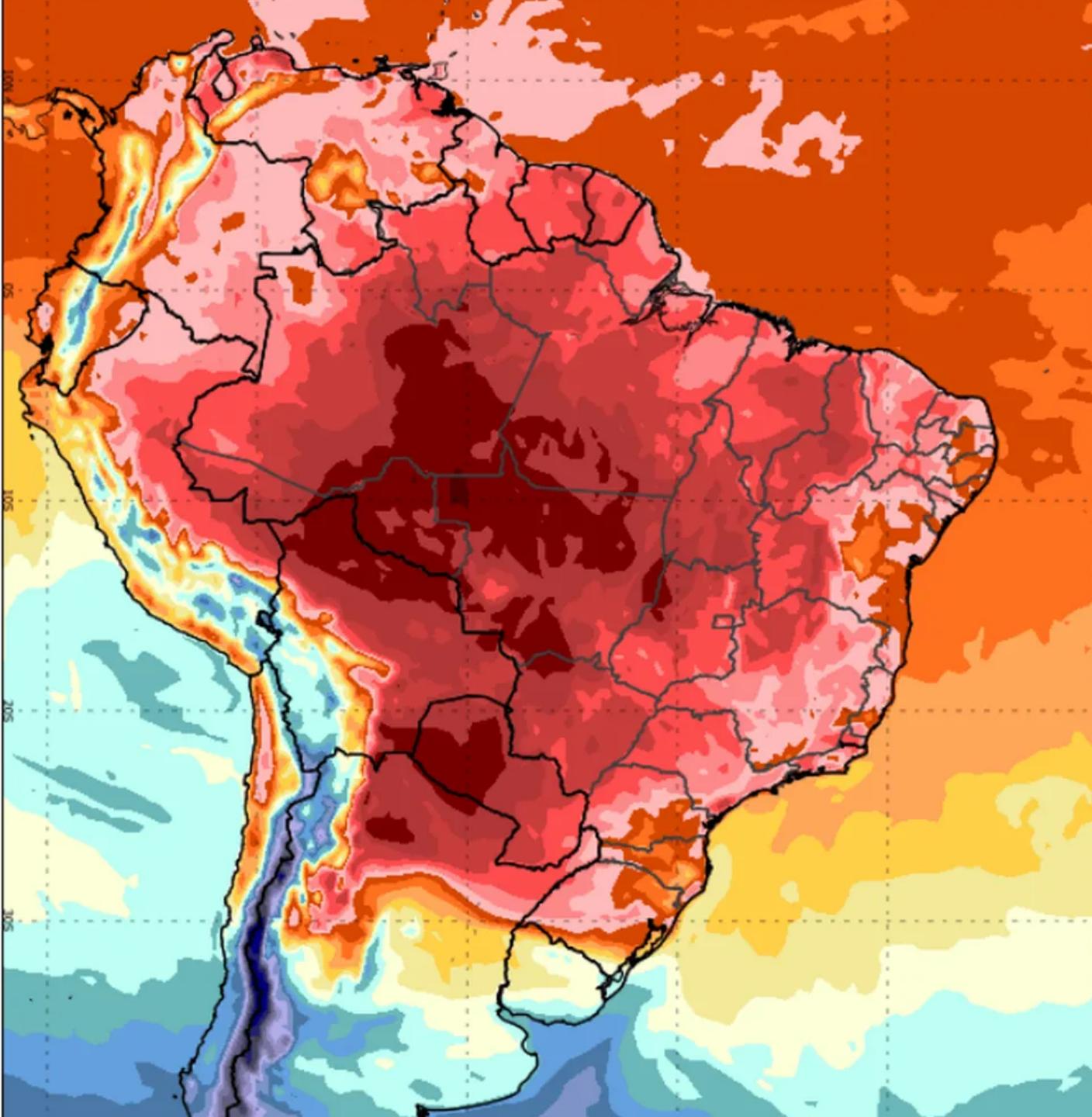
	NE _m	ME _m	k _m
Meat	80.3 ± 2.89	125.3	0.64
Dairy and Indigenous	74.0 ± 1.76	118.7	0.62

MP_M - SEX AND GENOTYPE EFFECT



Genotype
 $MP_m = 3.79 \text{ g/kg BW}^{0.75}$

I Similar trend for minerals



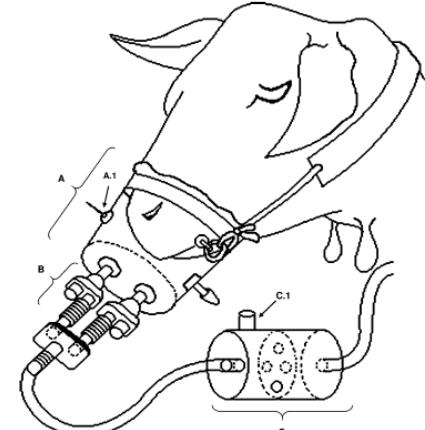
**HEAT WAVE IN
BRAZIL LAST WEEK
(22/AUG/23)**



WINTER

<https://g1.globo.com/ro/rondonia/noticia/2023/08/22/entenda-como-a-onda-de-calor-extremo-atinge-rondonia-e-mantem-temperaturas-acima-dos-35oc.ghtml>

TEMPERATURE EFFECT ON ENERGY UTILIZATION



Fernandes et al., J. An. Physiol. An. Nut., 101:15-21, 2017

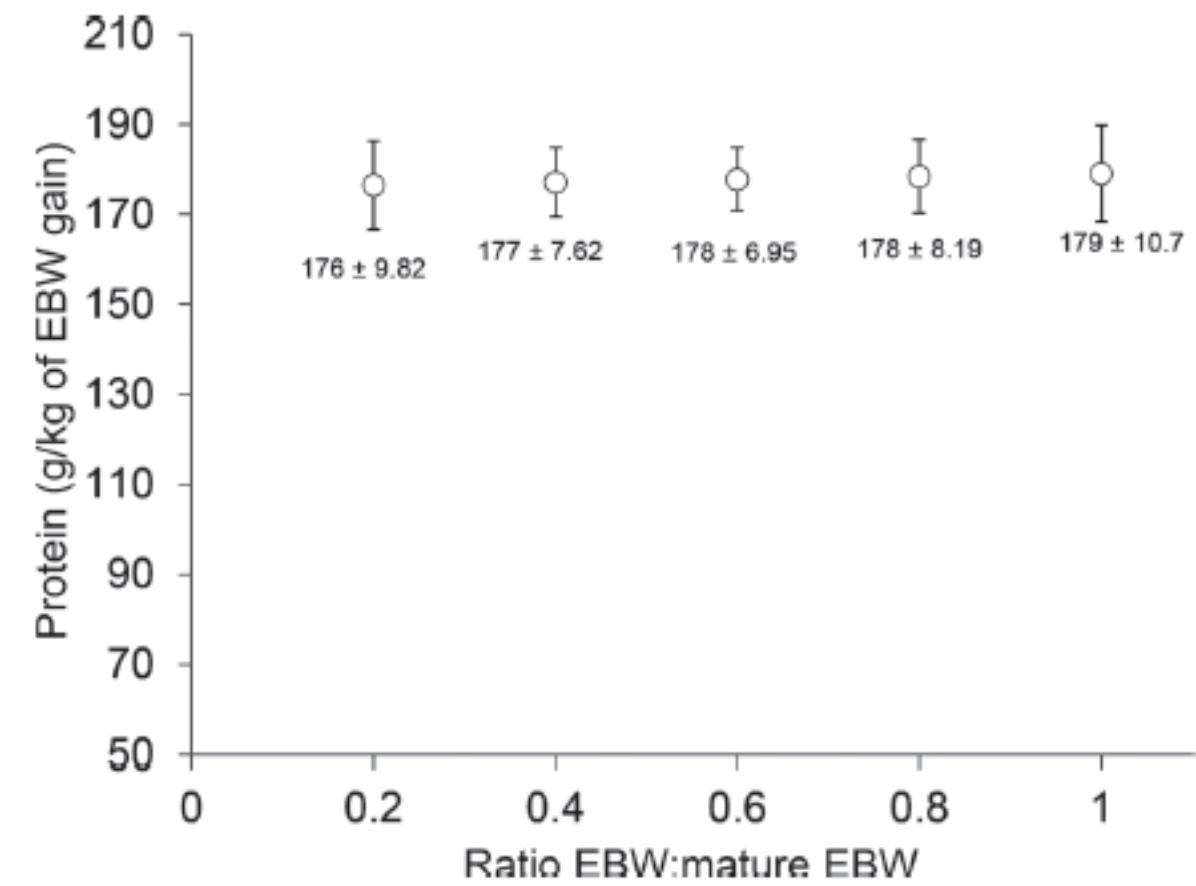
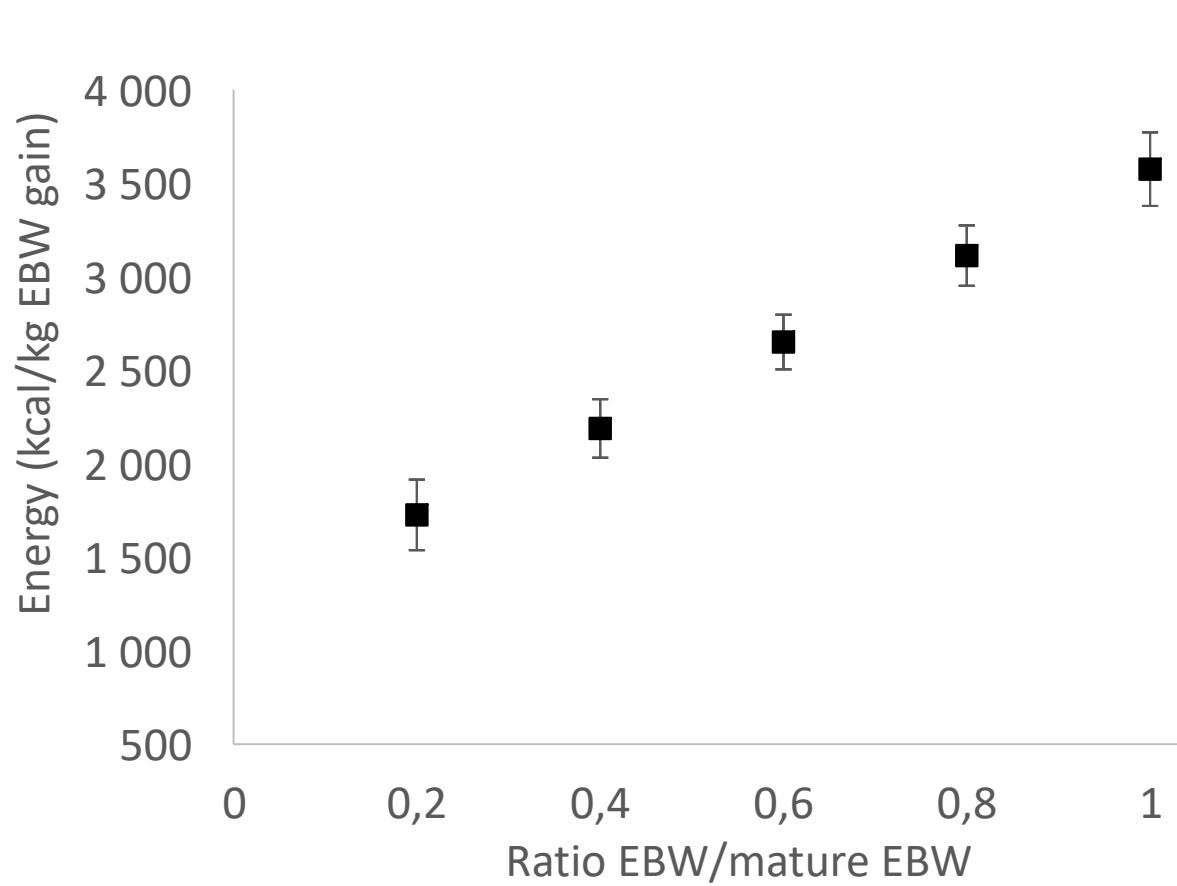
	10 °C	20 °C	35 °C	SEM
GEI (kcal/kg ^{0.75} BW/d)	197.0	175.8	148.4	18.8
ME/DE	0.85	0.86	0.79	0.05
Methane (% GEI)	7.40	5.70	8.80	1.20



https://www.123rf.com/free-stock-images/kid_goose.html

REQUIREMENTS FOR GROWTH

NE_G NP_G ACCORDING TO DEGREE OF MATURITY



K_G - SEX EFFECT

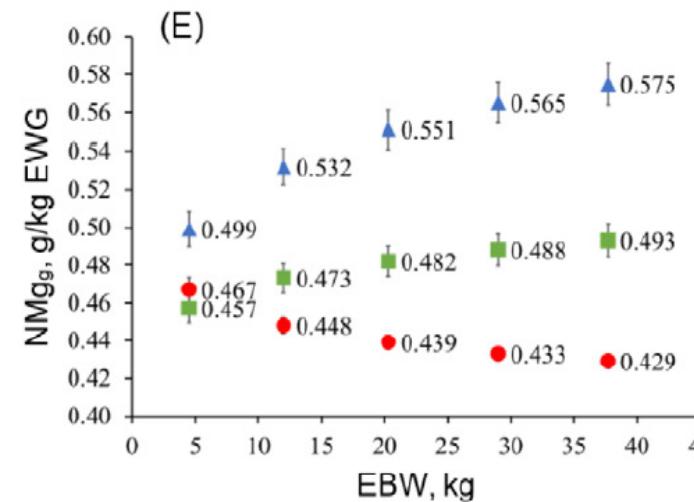
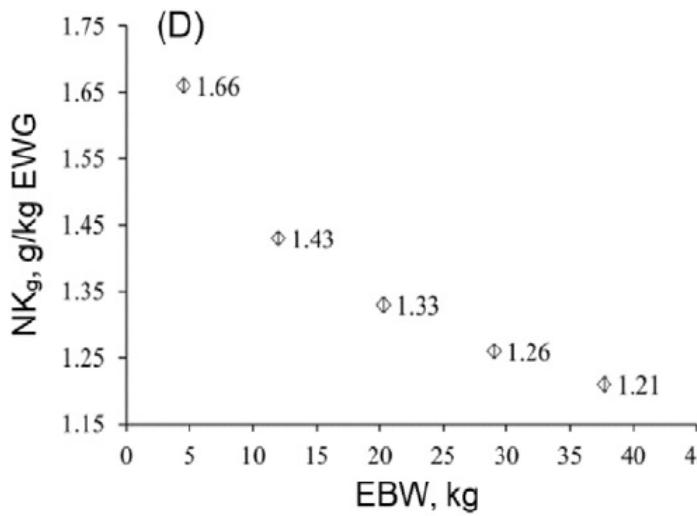
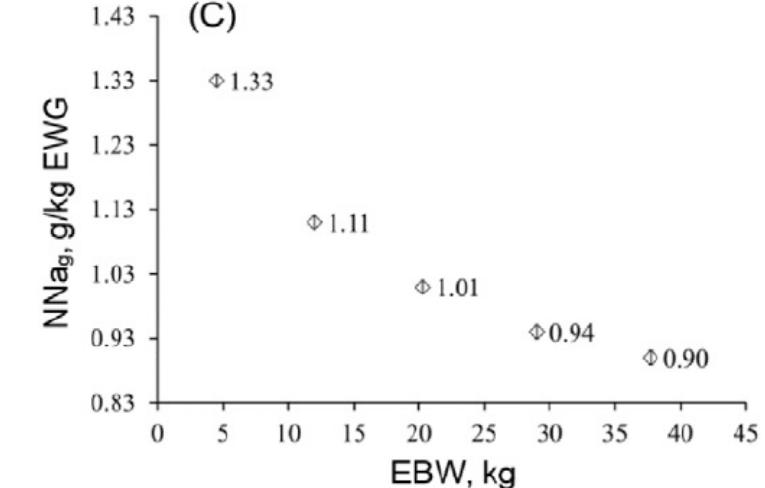
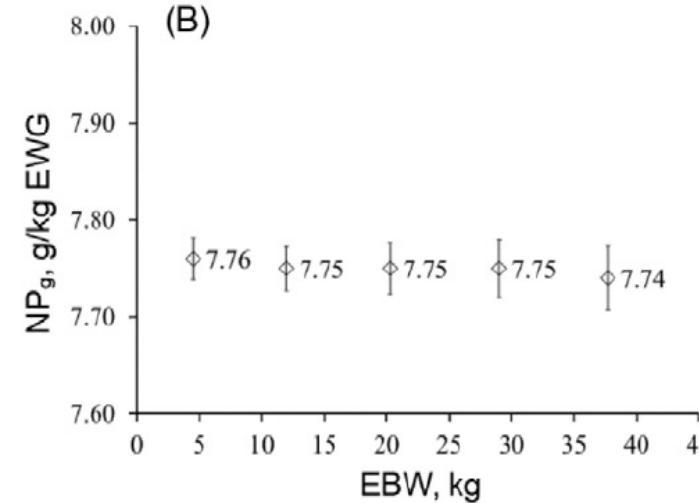
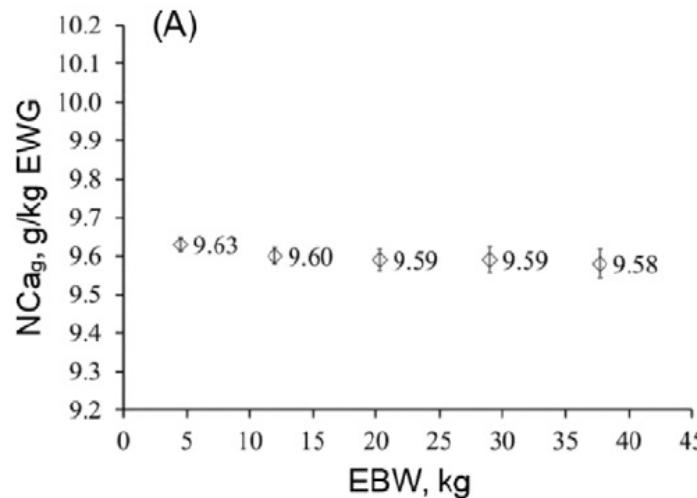
Castrated males: k_g = 0.32

Intact males: k_g = 0.260

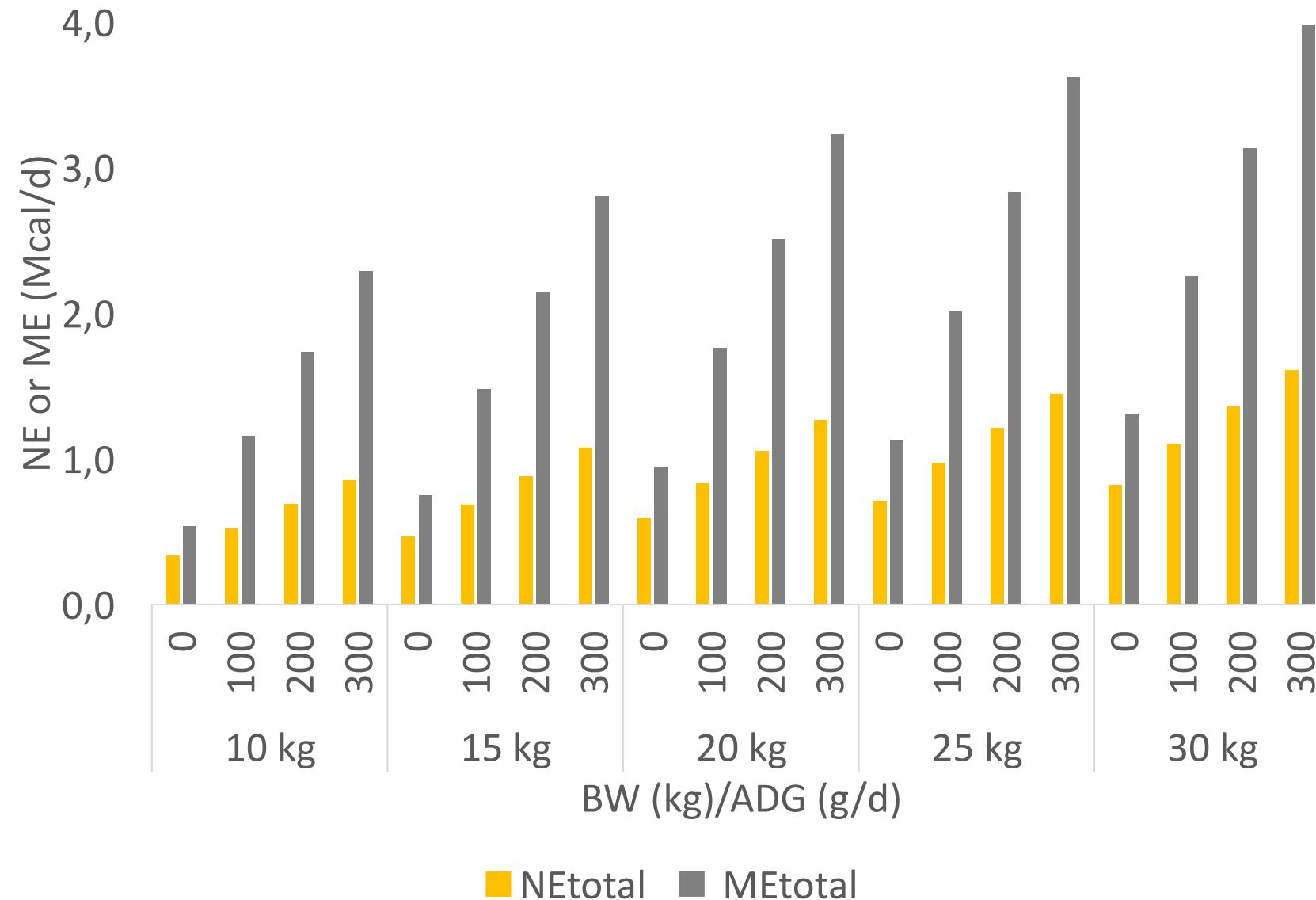
Females: k_g = 0.310

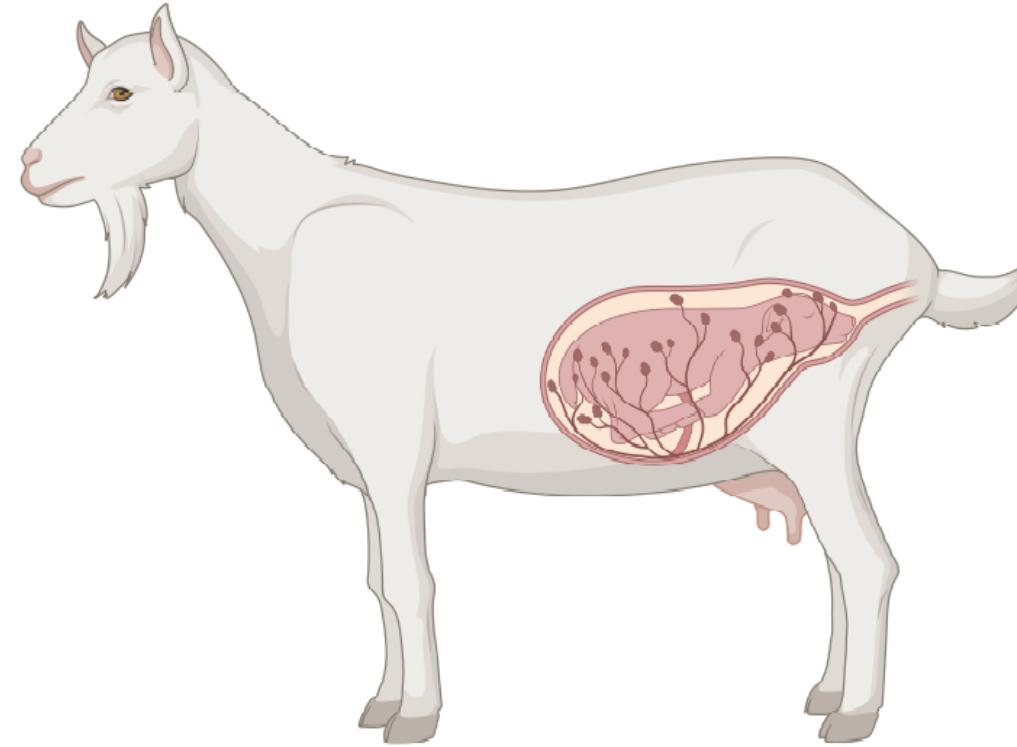
	k _p			k _f		
	Mean	LCI	UCI	Mean	LCI	UCI
Castrated male	0.227	0.172	0.295	0.854	0.63	0.989
Intact male	0.205	0.177	0.237	0.735	0.52	0.945
Female	0.209	0.159	0.271	0.833	0.592	0.989
Overall	0.213	0.189	0.242	0.806	0.653	0.955

NET MINERAL FOR GROWTH



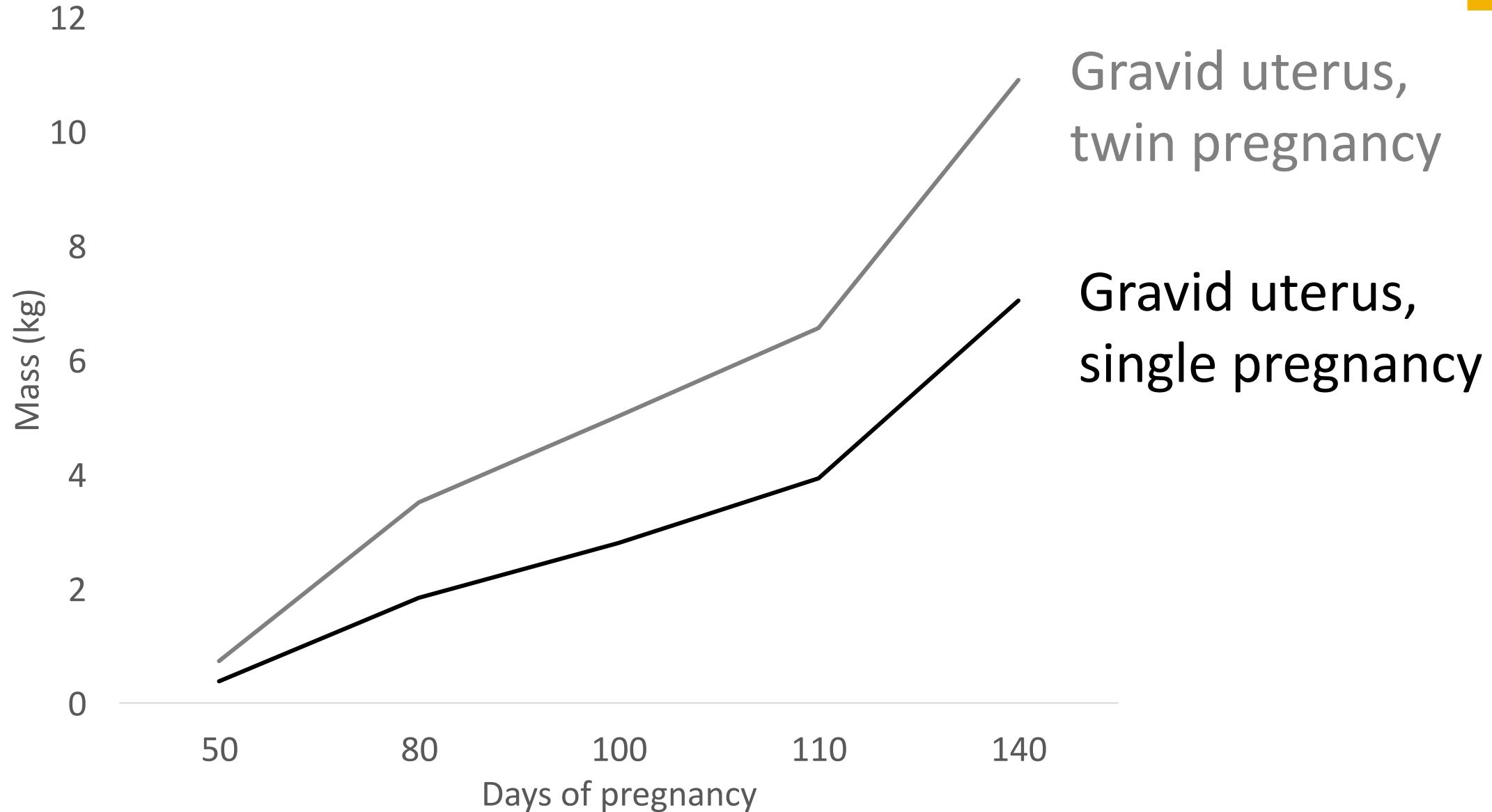
SIMULATION - ENERGY REQUIREMENTS OF GOATS





REQUIREMENTS FOR PREGNANCY

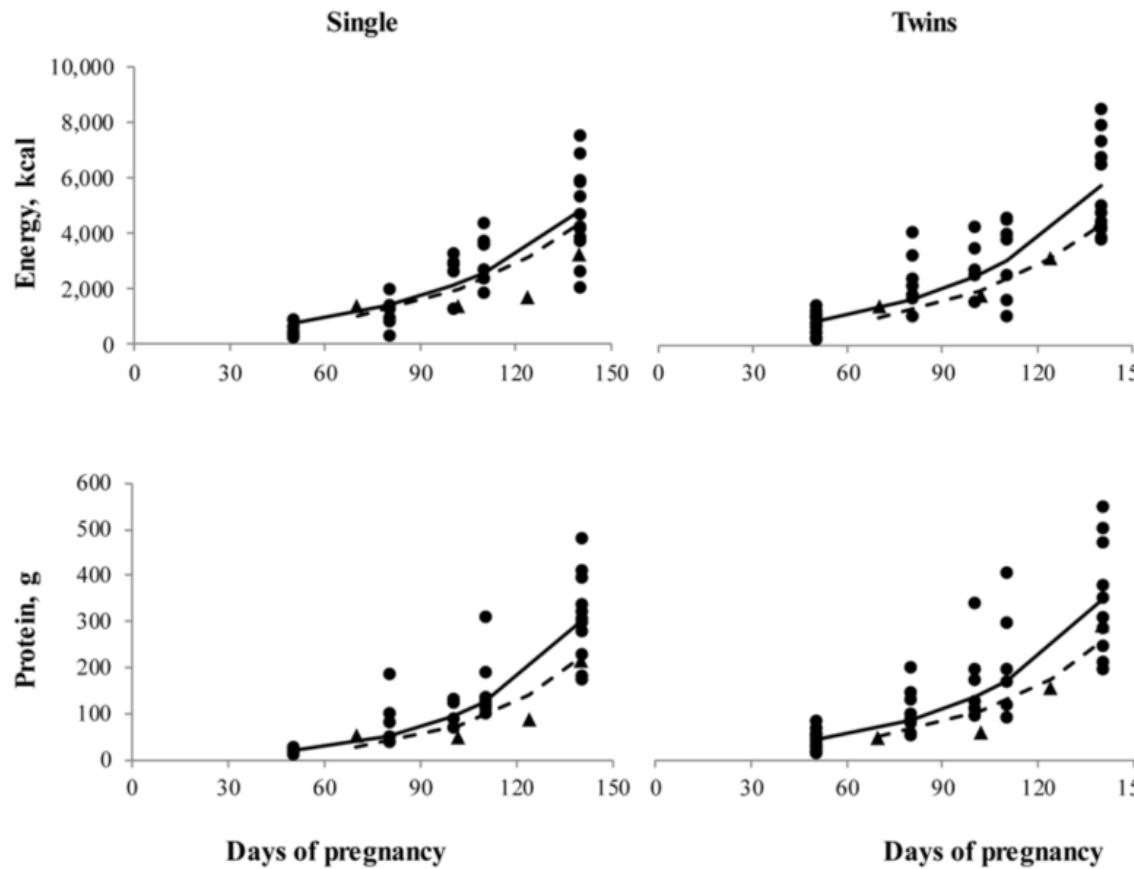
GRAVID UTERUS AND UDDER DEVELOPMENT



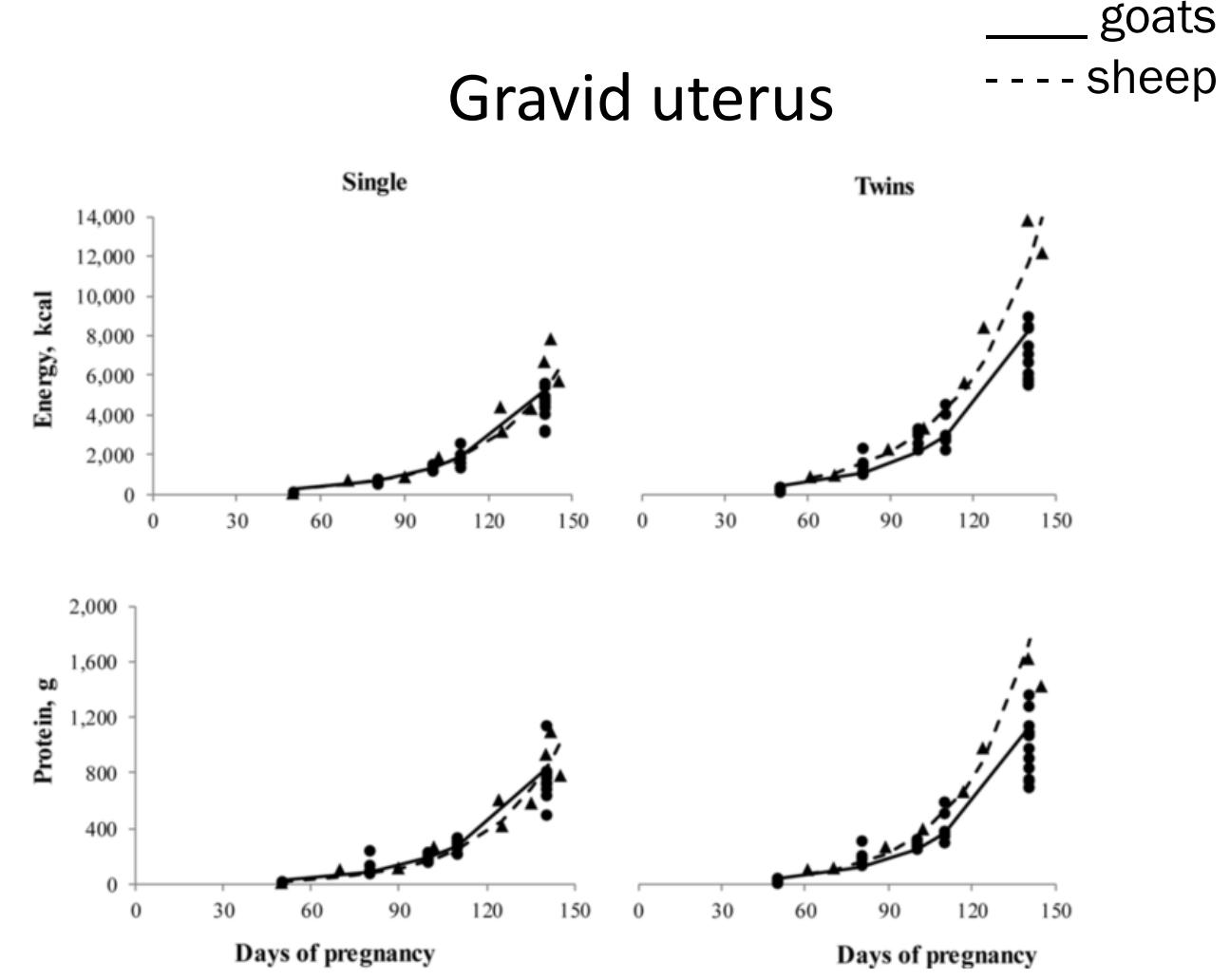
ENERGY AND PROTEIN CONTENT OF MAMMARY GLAND AND GRAVID UTERUS OF GOATS AND SHEEP CARRYING SINGLE AND TWIN FETUSES



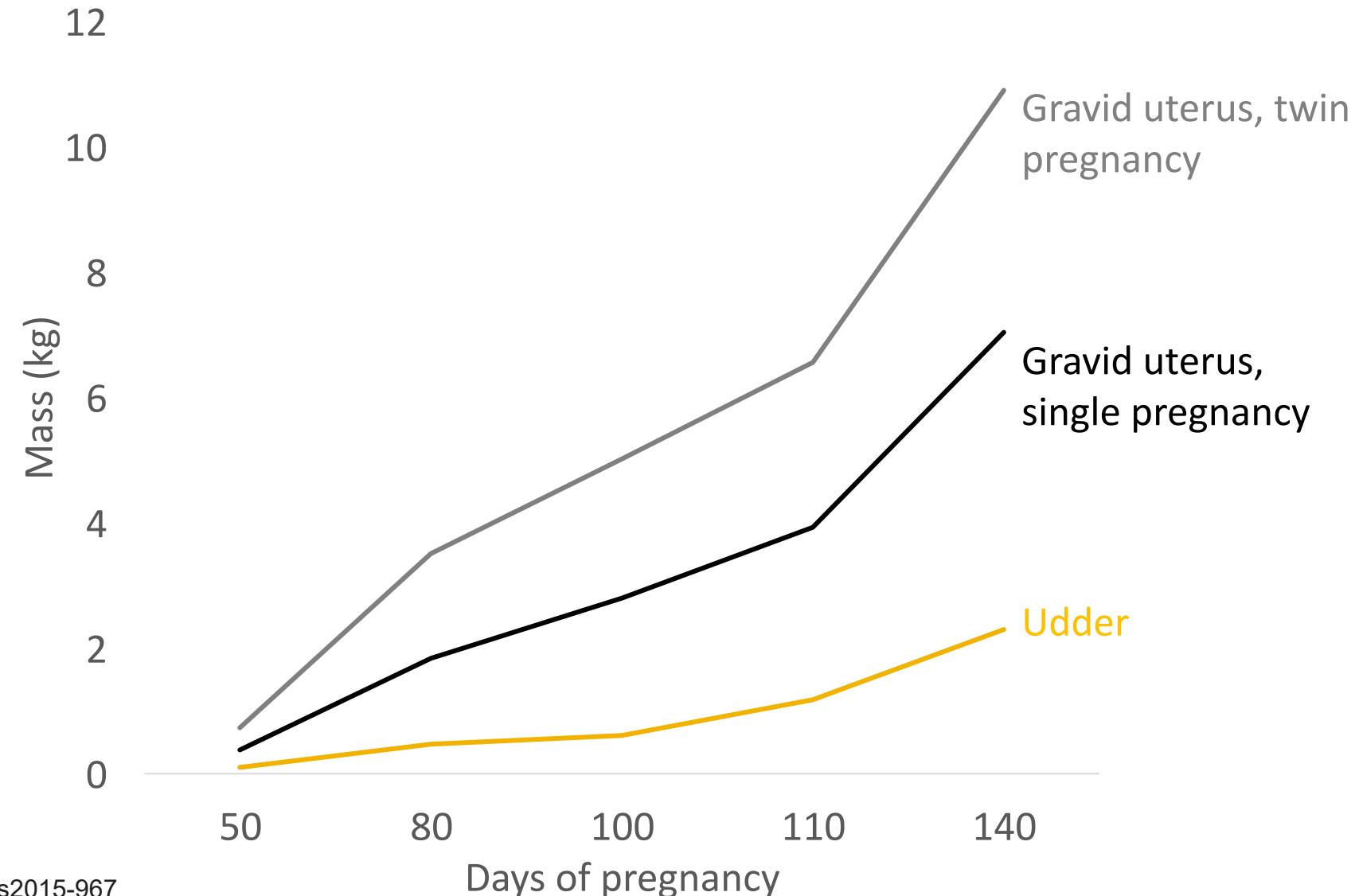
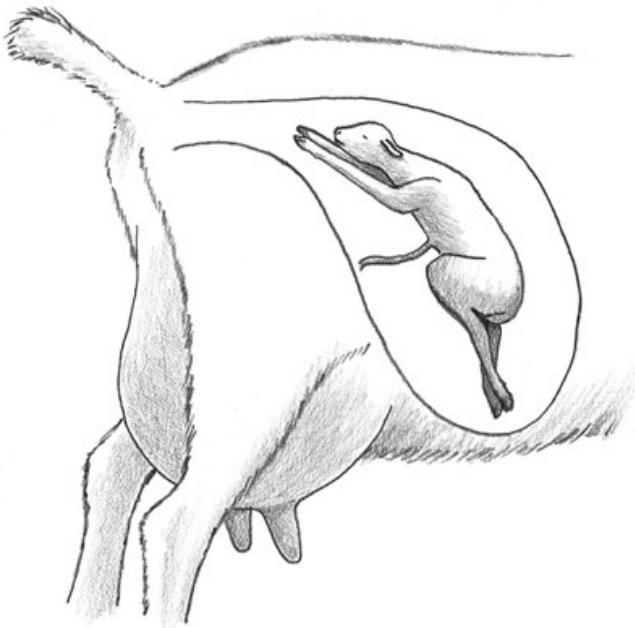
Mammary gland



Gravid uterus



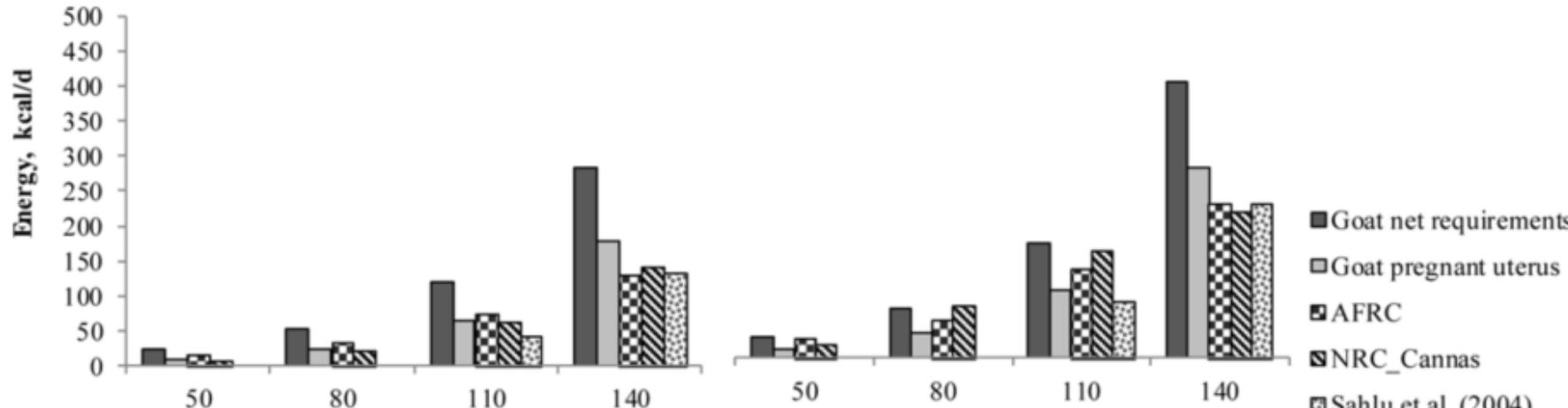
GRAVID UTERUS AND UDDER DEVELOPMENT



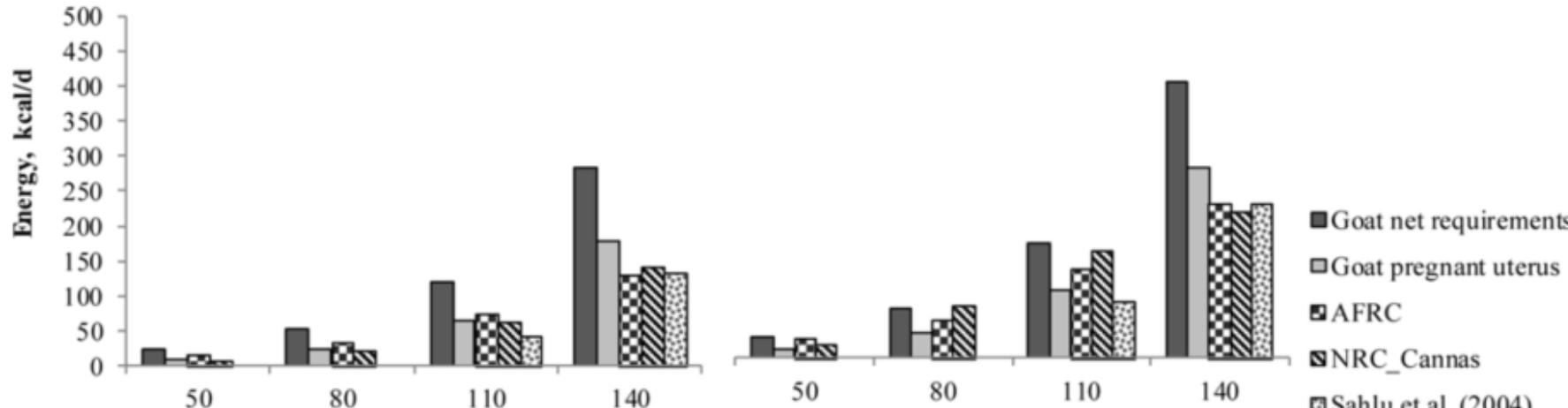
NET ENERGY AND PROTEIN REQUIREMENTS FOR PREGNANCY



Single

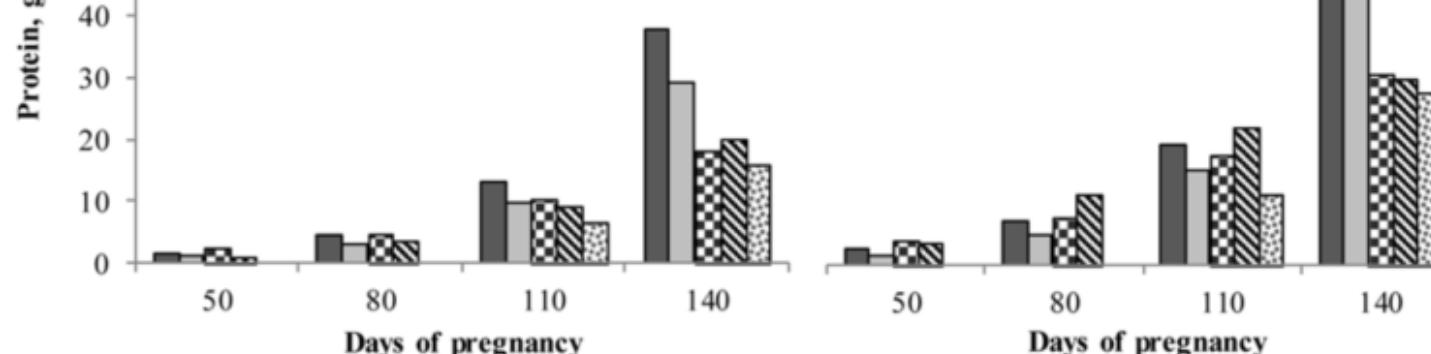


Twins



Days of pregnancy

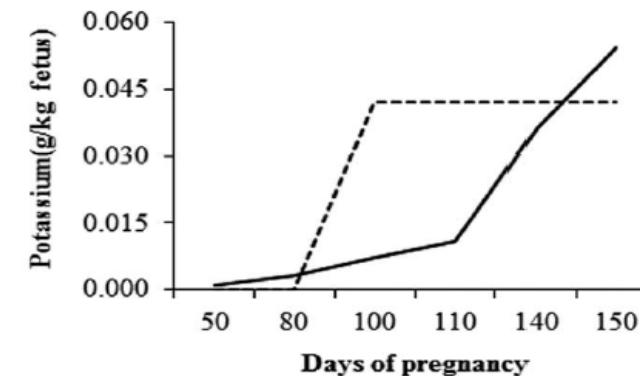
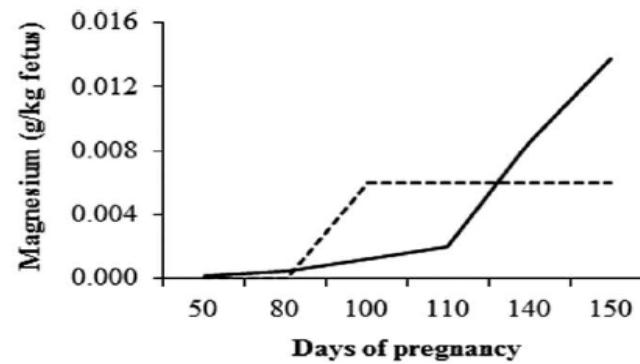
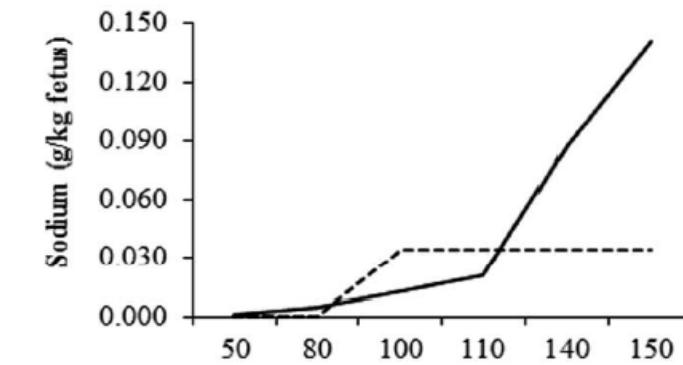
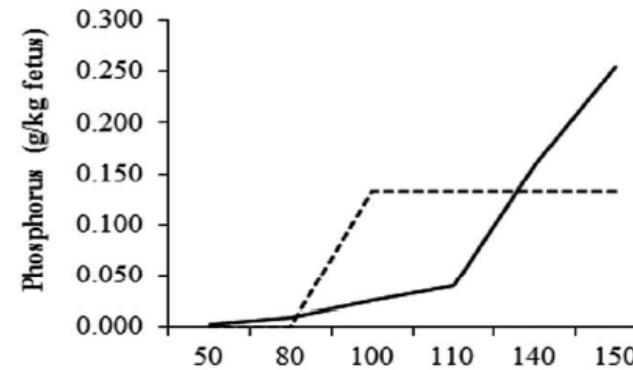
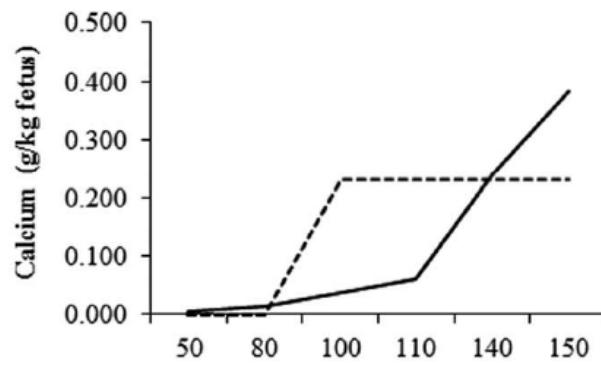
Protein, g/d



K_{preg} is variable

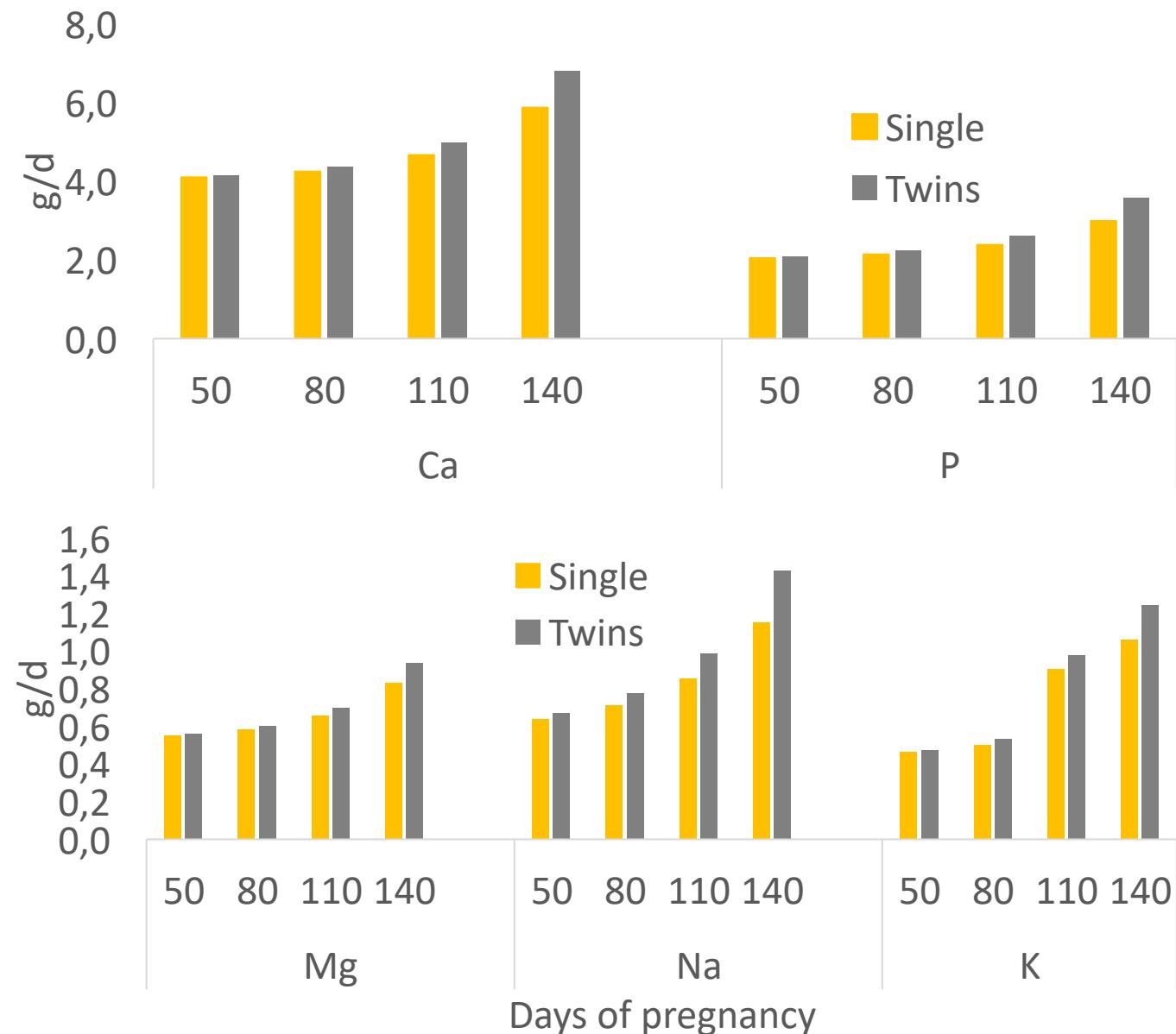
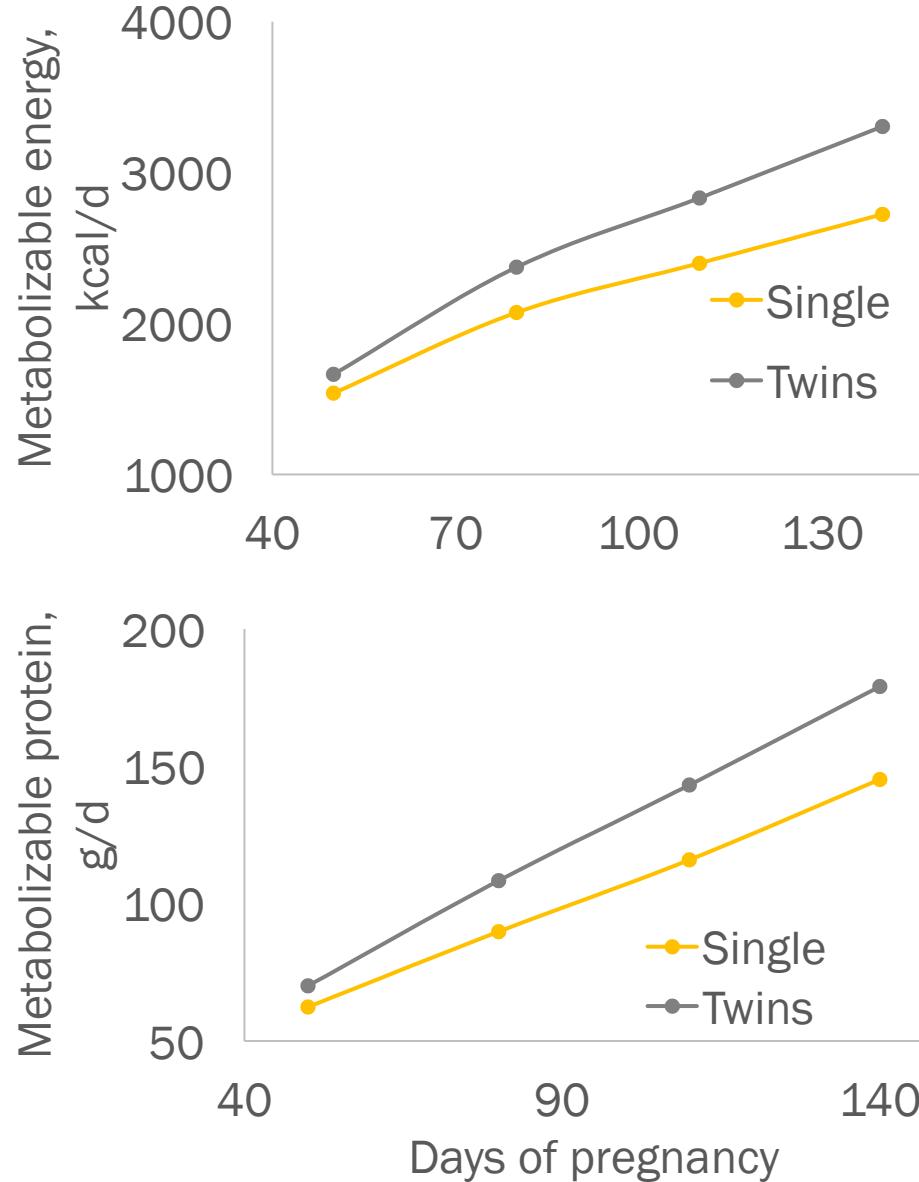
	80	110	140	NRC	INRA
$K_{\text{pregE}} =$	0.06	0.10	0.19	0.12	0.14
$K_{\text{pregP}} =$	0.12	0.21	0.42		

MINERAL ACCRETION IN FETUSES AS PROPORTION OF FETUS MASS AT BIRTH



— Observed
- - - NRC

TOTAL DIETETIC REQUIREMENTS OF PREGNANT GOATS



FINAL REMARKS



- Energy and protein requirements for maintenance and growth of goats are not influenced by sex and genotype when mature weight is considered in the models
- Maintenance and growth requirements of major minerals are not affected by sex and genotype
- Goats raised under high temperatures showed different energy utilization
- k_p increased with the progress of pregnancy
- Requirements for pregnancy differs between single and twin

WHAT CAN BE IMPROVED IN THE DATABASE?



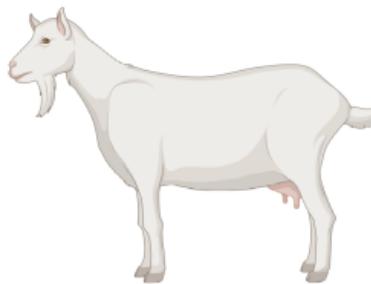
I Low diversity of diets



I Grazing information is limited



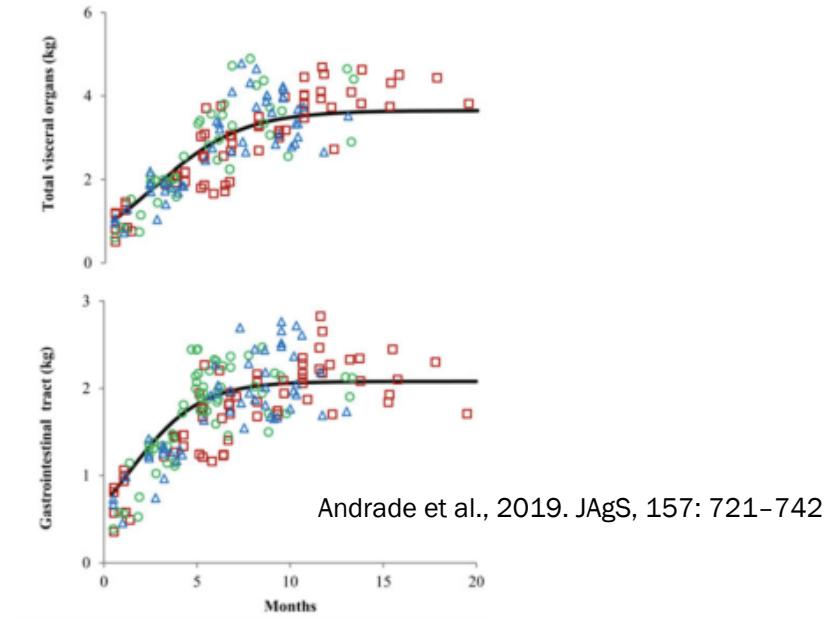
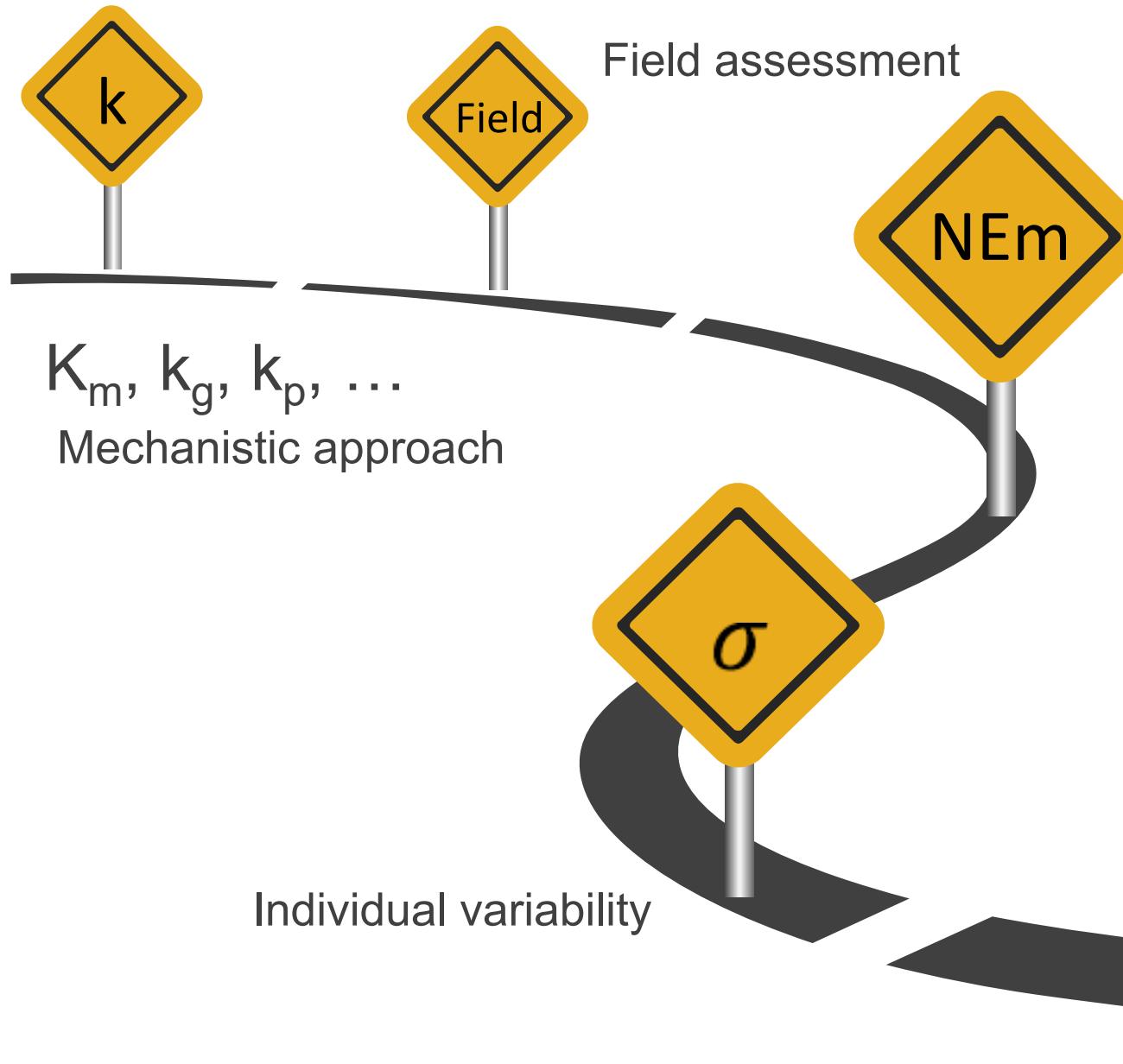
I Activity



I Requirements of lactating does

I Interaction of nutrients

FUTURE DIRECTIONS



Br- small ruminants

FUTURE DIRECTIONS



Data sharing



University
of Idaho

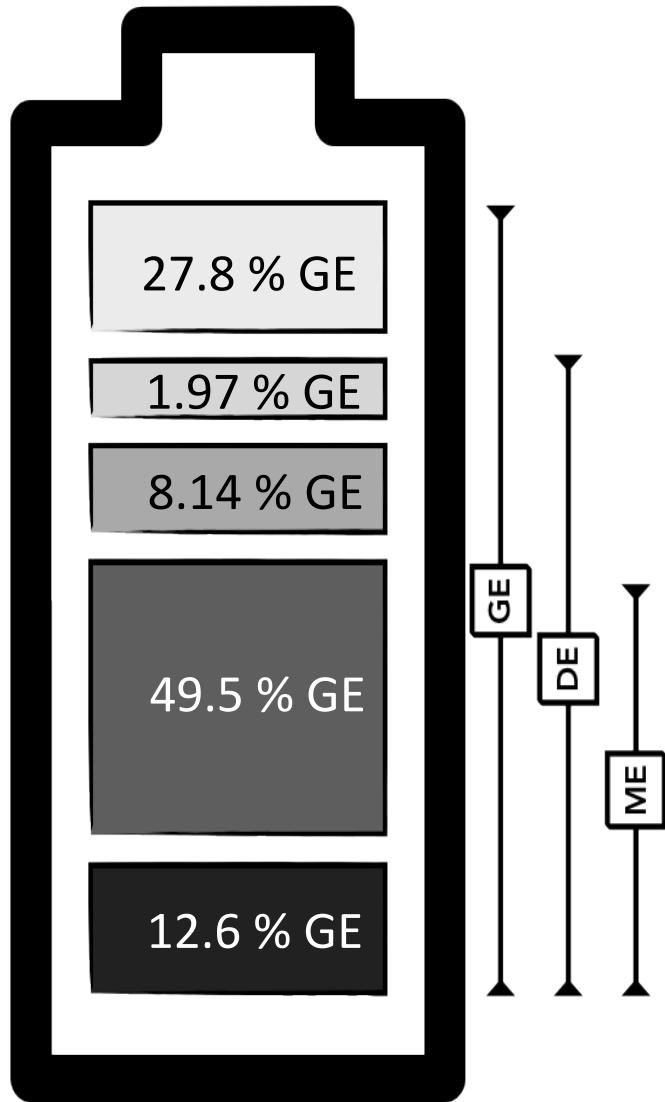


UPDATE OF NUTRITIONAL REQUIREMENTS OF GOATS FOR GROWTH AND PREGNANCY IN HOT ENVIRONMENTS

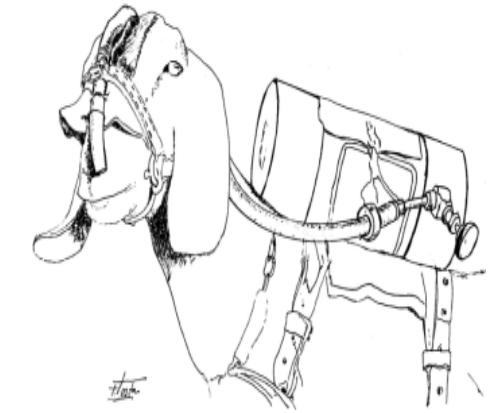


**University
of Idaho**

ENERGY PARTITIONING



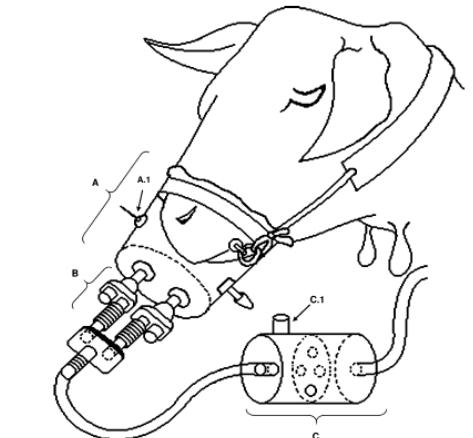
~ 6 % GE



Lima et al., 2016. RBZ, 45:781-787

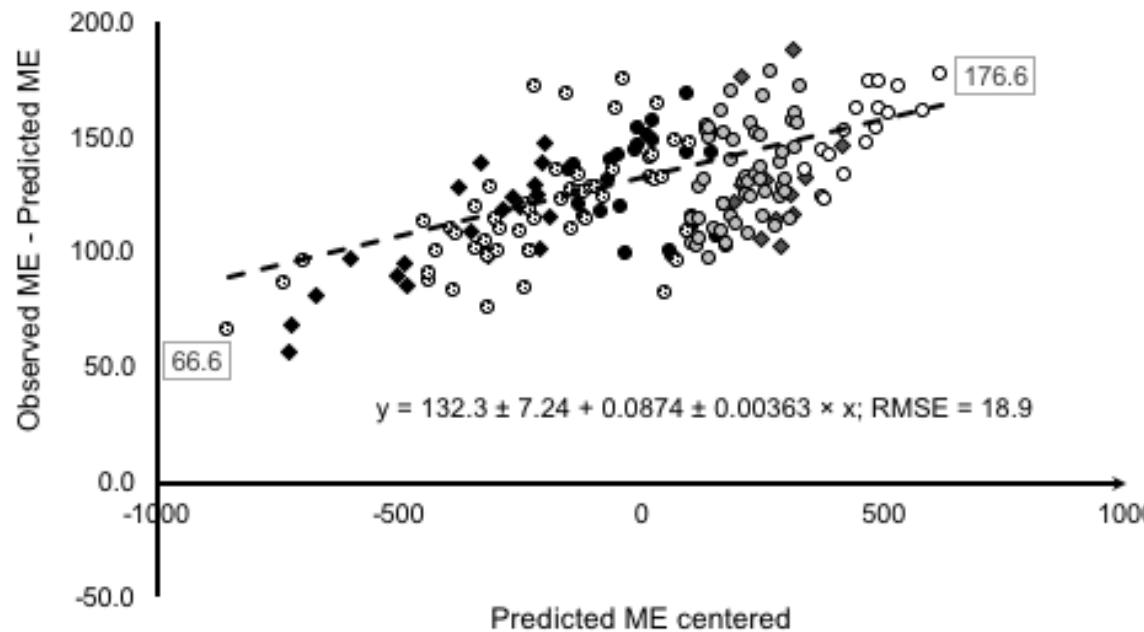
~ 9 % GE

Silveira et al., 2019. Anifee, 248:67-76

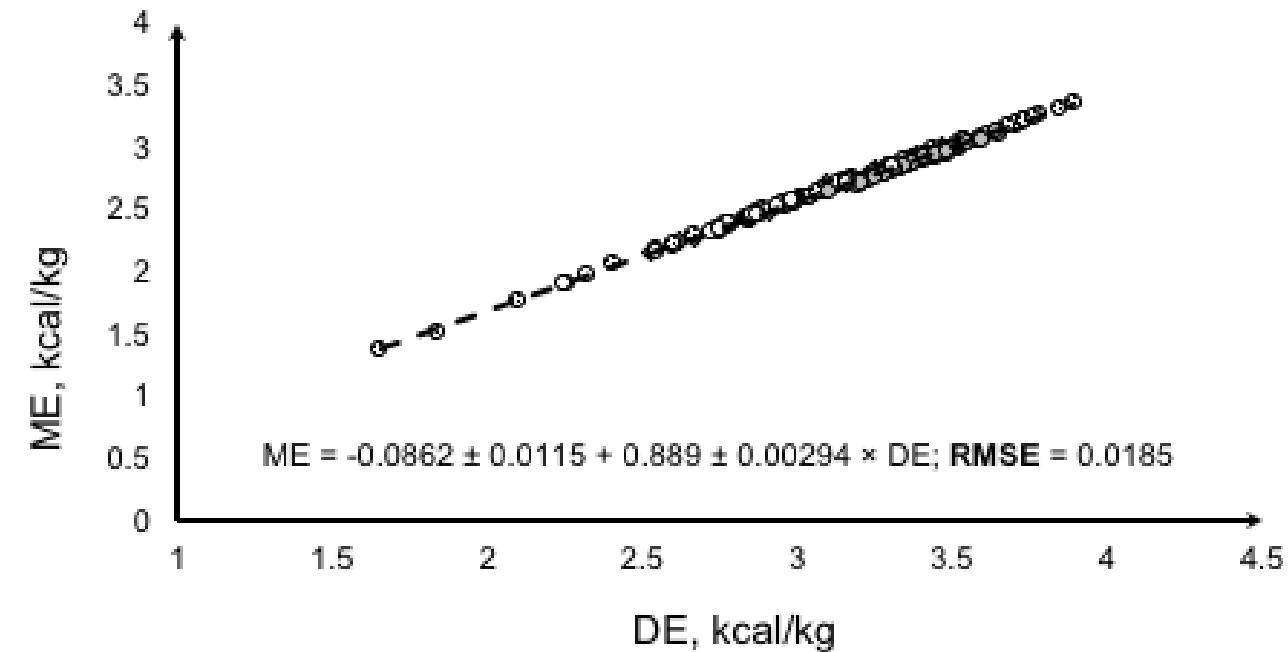


Fernandes et al., 2017. JAPAN, 101:15-21

ME ESTIMATIVE

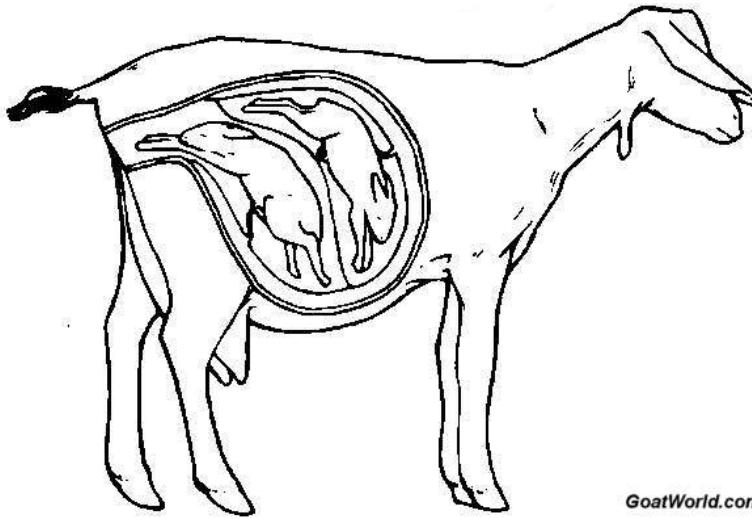


Residual (observed ME minus predicted ME = $0.82 \times$ DE) on the predicted values centered on their mean



	Mean	LCI	UCI
ME:DE	0.88	0.87	0.90

Dry matter (DM; 1 fetus ▲ and 2 fetuses □) and crude protein (CP; +) intake in dairy goats throughout the pregnancy



GoatWorld.com

