CHAPTER 9: OTHER MEASURES ON LIVESTOCK

1. DETERMINATION OF AGE

1.1. INTRODUCTION

Temporary teeth (milk teeth) and permanent teeth

Like children, young animals have temporary teeth (milk teeth) which will be replaced by permanent teeth.

Young ruminants have 20 temporary teeth, adult ruminants have 32 permanent teeth. So 12 more teeth: 6 on the upper jaw and 6 on the lower jaw. Table 1 shows this formula:

Table 1: Dental formula of milk and permanent teeth

Temporary teeth (milk teeth): 20 teeth		
Upper jaw: :	No incisors	6 molars
lower jaw, :	8 incisors	6 molars
permanent teeth: 32 teeth		
Upper jaw:	No incisors	12 molars (+6)
lower jaw:	8 incisors	12 molars(+6)

Nb : Do not forget that you will not be able to determine the exact age of the animal from its teeth; there will be a discrepancy of a few months more or less. You will need to get into the habit of periodically checking the animals' teeth (not just to determine age), but also because badly conditioned or worn teeth prevent an animal from eating or ruminating. Such an animal is no longer useful..

1.2. LEARNING OBJECTIVES

After studying this module, you should know:

- How to hold animals (Sheep, Goats, and Cattle) to check their teeth.
- What is the difference between temporary teeth (milk teeth) and permanent teeth.
- How to determine the age of sheep, goats, cattle, and buffaloes.

1.3. ESTIMATION OF AGE IN CATTLE

To determine the age of animals, the front teeth (incisors) must be examined. It should be noted that you will not be able to determine the age accurately, especially in older animals.

(1) Less than 2 years (no permanent teeth)

(2) 2 years and 3 months old (2 permanent teeth)

(3) 3 years old (4 permanent teeth)

(4) 3 years and 6 months old (6 permanent teeth)

(5) 4 years old (8 permanent teeth)

(6) Animal older than 4 years

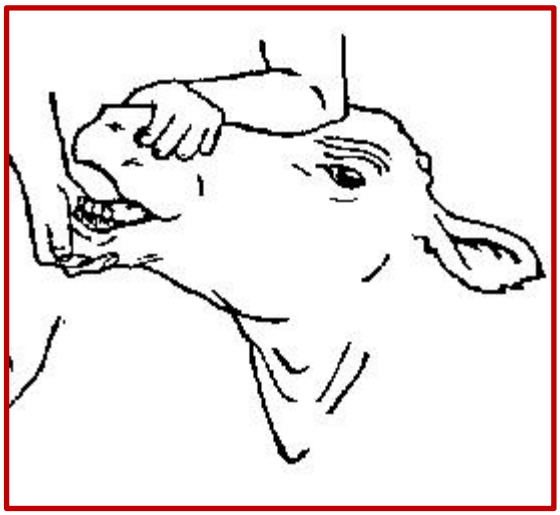


Figure1 : How to Immobilize Sheep and Goats to Check Their Teeth

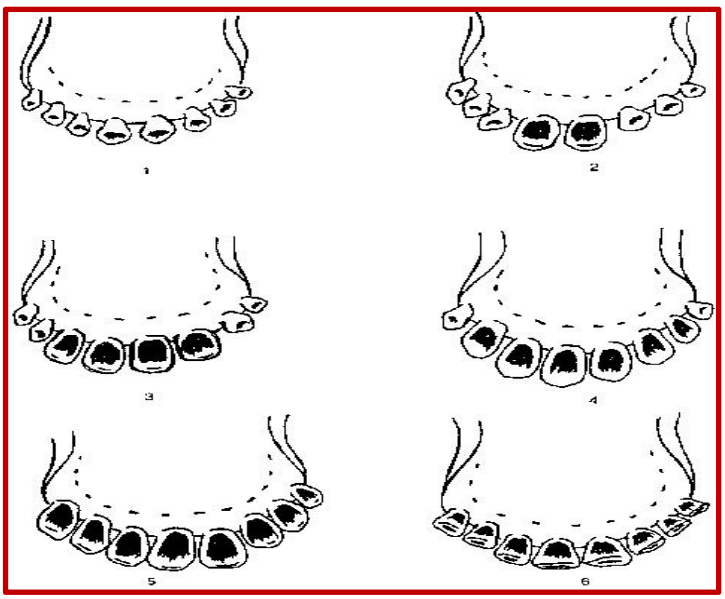


Figure2 : Determination of the age in cattles

1.2. AGE ESTIMATION IN SHEEP AND GOATS

You can determine the age of animals by examining the front teeth. The same applies to cattle; you will not be able to determine the exact age, especially in older animals.

Figure3 :How to immobilize Sheep and Goats to Check Their Teeth

(1) Animal less than 1 year old (no permanent teeth)

(2) 1 year old (2 permanent teeth)

(3) 2 years old (4 permanent teeth)

(4) 3 years old (6 permanent teeth)

(5) 4 years old (8 permanent teeth)

(6) Animal older than 4 years

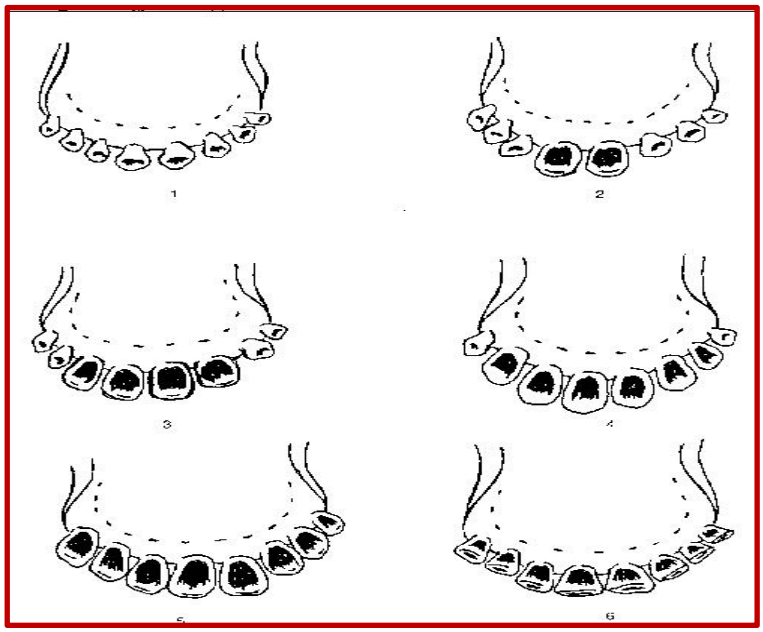


Figure4 : Age determination in sheep and goat (FAO, 2016)

MEASUREMENTS USED (Measurements used on animals)

2.1. MEASUREMENTS IN SHEEP

Table 1 represents these standard criteria.

Table 1: Different non-uniform categories (Cheik & Hamdani, 2007, cited in Ghani, 2016)

Female of the species	Hypometry		Eumetry		Hypermetry	
	Height at the weither (HW)	Weight	Height at the weither (HW)	Weight	Height at the weither (HW)	Weight
Ovin	/	40kg	/	50-70kg	/	80kg

EXTERNAL MEASUREMENTS

The principle of measurements is as follows:

• Head length (HL): Distance between the nape and the tip of the nose;

• Ear length (EL): Measured from the base to the lower end;

• Neck length (NL): Distance between the throat and the shoulder angle;

• Body length (BL): Distance between the tip of the shoulder and the tip of the rump;

• Pelvis length (PL): Distance between the tips of the hips and the tips of the rumps;

• Pelvis (Hip) width (PW; HW): Distance between the two hip tips;

• Ischium width (IW): Distance between the tips of the rumps;

• Chest circumference (CC): Measurement passing vertically behind the withers and at the girth passage level;

• Chest width (CW): By passing the measuring tape behind the withers at the girth passage.

• Chest depth (CD): Estimated at the strap passage behind the front legs;

• Withers height (WH): Distance from the top of the withers to the ground, This is the most frequently cited parameter to gauge the size of the animals.

• Back height (BH): Distance from the middle of the back to the ground;

• Sacrum height (SH): Distance from the croup to the ground;

• Flank depth (FD): Measured at the deepest part of the animal or estimated at the flank (from the point of the hips to the stifle);

• Hair length (HL): Measured along the back line from the root to the end;

• Front cannon circumference (FCC): Circumference of the cannon one handbreadth below the lower part of the knee joint;

• Tail length (TL): Distance from the tail attachment point to the tip; (Tables 2& 3).

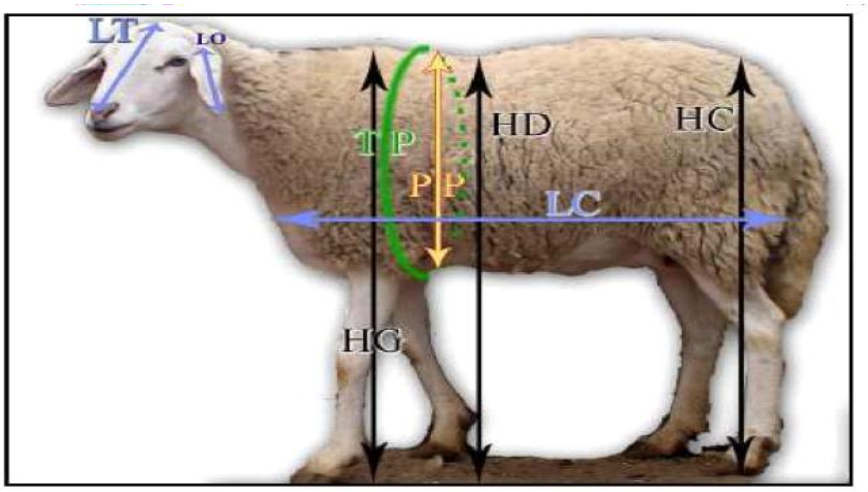


Figure 1: Some biometric measurements : LT= HL (Head Lenght) ,LO=EL (Ears Lenght) , HG= HW (Height at the weither), TP= CC (Chest Circumfrenece), PP=CD (Chest Depth) , HD= BW (Back Weight), LC= BL (Body Lenght), HC=Height at the Rump.(Laoun, 2007).

Table 2 : quantitatives variables (Manallah, 2012)

Number of variable	Variables	Abbreviations	Characteristics
1	Head Lengh	HL	Incm
2	Ears Lenght	EL	Incm
3	Neck Lenght	NL	Incm
4	Body Lenght	BL	Incm
5	Pelvis Lenght	PL	Incm
6	Pelvis Width	PW	Incm
7	Ischium Width	IW	Incm
8	Chest Circumfrerence	CC	Incm
9	Chest Depth	CD	Incm
10	Chest Width	CW	Incm
11	Height at weither the	HW	Incm
12	Heith at Back	HB	Incm
13	Height at sacrum	HS	Incm
14	Flank Depth	FD	Incm
15	Hair Lenght	HL	Incm
16	Fronte Cannon Circumference	FCC	Incm
17	Tail Lenght	TL	Incm

Table 3 : Differents measurements and their principles (Manallah, 2012)

Variables Number	Noun of the variable Measured (In cm)	Abbreviation	Principle
1	Longueur du corps	LCrps	distance entre la pointe de l'épaule et la pointe de la fesse
2	Hauteur au garrot	HG	Distance du sommet du garrot au sol
3	Hauteur au dos	HD	Distance du milieu du dos au sol
4	Hauteur au sacrum	HS	Distance de la croupe au sol
5	Longueurs des oreilles	LO	Mesurée de la base à l'extrémité inférieure
6	Longueur de la queue	LQ	Distance entre le point d'attachement de la queue jusqu'à l'extrémité
7	Tour de poitrine	TP	Mesure passant verticalement en arrière du garrot et au niveau du passage de
8	Profondeur de poitrine	PP	Estimé au passage de sangle à l'arrière des pattes antérieures
9	Longueur du bassin	LB	Distance entre les pointes des hanches et les pointes des fesses
10	Longueur du cou	LC	Distance entre la gorge et l'angle d'épaule
11	Longueur de la tête	LT	Distance entre la nuque et le bout de nez
12	Tour canon antérieur	TCA	Circonférence du canon à un travers de main au-dessous de la partie inférieurde l'articulation du genou
13	Longueur de poil	LPl	Est faite au niveau de la ligne du dos de la racine à l'extrémité
14	Largeurs aux ischions	LI	Distance entre les pointes des fesses
15	Profondeur du flanc	PF	Mesurée au plus profond de l'animal ou estimée au flanc
16	Tour abdominal	TAB	circonférence abdominal passant verticalement en arrière du sacrum
17	Tour du cou	TCO	Circonférence du cou dans sa partie médiane
18	Largeur aux hanches	LH	Distance entre les deux points de hanches

•QUALITATIVE CHARACTERS

On the other hand, 15 phenotypic variables were studied:

Coat pattern (CP), Head pattern (HP),Head color (HC), Coat color (CC),Leg color (LC),

Presence of horns (PH), Horn shape (HS), Horn orientation (HO), Ear length (EL), Ear orientation (EO), Facial profile (head) (FP),Pendulums (PEN), Beard (BE), Dorsal line profile (DLP), and Udder (UD). (Tables 4 & 5).

Table 4: Studied qualitative variables. (Addouche and Mareiche 2021))

Number of variables	Characters	Abbreviation	Modaliy
1	Coat pattern	CP	(1) uniform, (2) brindled, piebald, (3) speckled (small spots)
2	Head pattern	HP	(1) uniform, (2) streaks, (3) speckled
3	Head color	HC	(1) white, (2) black, (3) gray, (4) black and white, (5) multicolor
4	Coat color	CC	(1) black, (2) white, (3) gray, (4) black and white, (5) multicolor
5	Leg color	LC	(1) white, (2) black, (3) black and white, (4) several colors, (5) gray
6	Presence of horns	PH	(1) Absence, (2) Presence
7	Horn shape	HS	(1) straight, (2) curved, (3) spiral
8	Horn orientation	HO	(1) backward, (2) slanting upward, (3) lateral,
9	Ear length	EL	(1) long, (2) medium(3)short
10	Ear orientation	EO	(1) hunging, (2) semi-hunging, (3) upright, (4) horizontal
11	Facial profile (head)	FP	(1) straight, (2) concave, (3) convex
12	Pendulums	PEN	(1) absents, (2) presents
13	Beard	BE	(1) absent, (2) present
14	Dorsal line profile	DLP	(1) (1) straight, (2) hollowed (curved), (3) descends from the withers, (4) descends from the croup,
15	Udder	UD	(2)Develop, (2) not develop

- **Visibles Characters**

A set of notations on external phenotypic characters was visually assessed (Table 5).

Table 5 : Qualitatives variables . (Manallah, 2012)

Number of variables	Variables	Abbreviations	Characteristics
1	Head color	CT	Black=1,White=2, melange=3
2	Presence of the Horns	PH	absents=1, presents=2
3	Horns Shape (Form)	HS	curveds=1,spiral=2
4	Ears Shape (Form)	ES	upright=1,semi-horizontals=2 hunging=3
5	Profile	**P**	Straight=1,convex=2
6	Coat color	**CC**	Black=1,White=2,melange=3
7	Presenceof the de la beard	**PB**	absent=1,present=2
8	Présence of the Pendulums	**PP**	absents=1,presents=2
9	Legs Color	LC	Black=1,White=2, melange=3
10	Udders	UD	Few develops=1, develps=2

2. GOATS MEASUREMENTS

An adult goat weighs between 50-70 kg for a height ranging from 70–85 cm. The morphological characterization is based on two types of characters, quantitative and qualitative, which are presented in the following two tables.

2.1. QUANTITATIVE VARIABLE

Table 01 : Quantitative Variables (FAO, 2013)

Specifiant the age			
Body Size in male and femals (at 0,5 cm near)		Male	Female
	Body Lenght		
	Height at the weither		
	Chest Circumference (girth)		
	Chest depth		
	Disatnce between Shoulders pointsdes		
	Croup Lenght		
	Croup Wodth		
	Head Lenght		
	Haed Width		
	Cannon Circumference (girth)		
	Horn lenght		
	Ear Lenght		
	Tail Lenght		
	Hair Lenght(Back line , on the croup(rump))		

2.1. QUALITAIVES VARIABLES

The table 2 represents these variables

Table 02 : Qualitative Variables (FAO, 2013)

Sexe	Femeale, male , castré
Age estimated or categorie of teeth	
Coat pattern (Motif)	Unie, panachures/ pie, moucheté (petites taches)
Coat color	Noir, rouge foncé, rouge clair, fauve, gris
Skin Color de la	
Fiber Type	mohair/angora, cachemire
Hair Lenght	moyen (1-2mm); long (>2mm)
Presence of the horns (at the level of herd ; separated Males and females)	Pourcentage d'animaux sans corne,pourcentage d'animaux avec cornes
Horn Shape	Partielle, droite, courbe, en spirale, en tire-bouchon
Horn orientation Presence of the horns (at the level of herd ; separated Males and females)	Latérale, oblique vers le haut, en arrière (indiquer également si l'animal n'a pas de cornes, si les cornes sont flottantes, ou si les cornes sont juste des moignons)
Ears orientation	Dressée, semi-pendante, pendante,horizontale
Profile facial (head)	Droit, concave, convexe, ultra-convexe
Présence of the Pendulums (& beard)	Absente, présente
Tail type	Fine, avec une croupe grasse, épaisse à labase, grasse
Tail Shape	Cylindrique et droite, cylindrique avec l'extrémité recourbée vers le haut, bilobée sans appendice, large sans lobe
Profil of the back line	Droit, descend vers la croupe, descend à partir du garrot, creusé (incurvé)
Profil of the croup	Plat, pentu, pointu

➢ There are primary and secondary characterizations as follows:

Primary measurements

Spiral Circumference or girth (SG): Distance between the shoulder angle and the tail.

Body length (BL): Distance between the tip of the shoulder and the tip of the

rump.

Chest Circumference or girth (CC; CG): Measurement passing vertically through

Rear of the withers and at the level of the strap passage.

Abdominal Circumference girth (AG;AC): Measurement passing vertically behind the sacrum and at the level of the udder.

Height at the withers (HW): Distance from the top of the withers to the ground.

Height at the hind limb (HHL): Distance from the back to the ground

Secondary measurements

→ Head length (HL1): Distance between the nape and the tip of the nose.

→ Head length (HL2): Distance between the tip of the nose and the throat.

→ Ear length (EL): Measured from the base to the lower end.

→ Neck circumference (NC): This is the circumference of the neck at its middle part.

→ Neck length (NL1): Distance between the throat and the shoulder angle.

→ Neck length (NL2): Distance between the end of the thorax and the throat.

→ Thigh circumference (TC): This is the circumference of the thigh at its middle part.

→ Tail length (TL): Distance between the point of attachment of the tail and the tip.

→ Distance between the eyes (DE).

→ Distance between the ears (DE).

→ Pastern circumference (PC).

→ Forearm circumference (Tab).

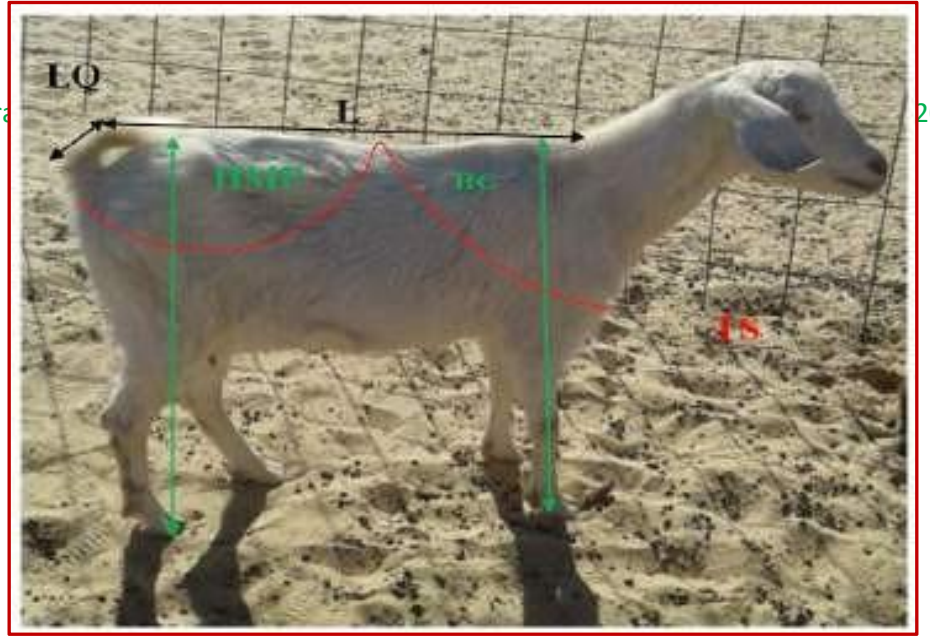


Figure1 : Primary or Main Measurements(Bensaadi,2016)

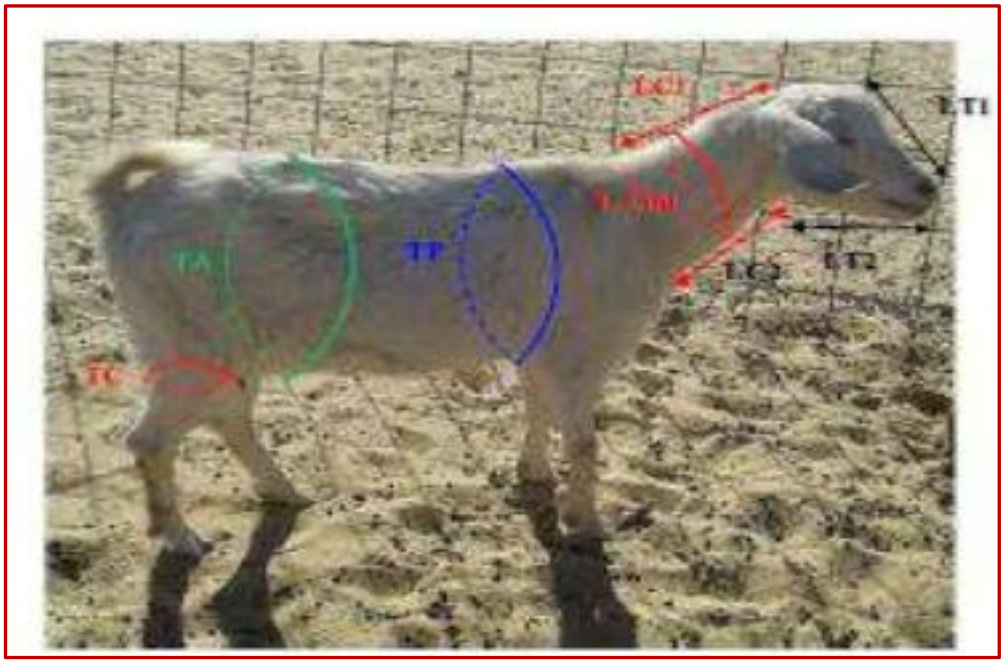


Figure2 : Secondary measurements (Bensaadi, 2016)

3. MEASURMENTS ON CAMELS

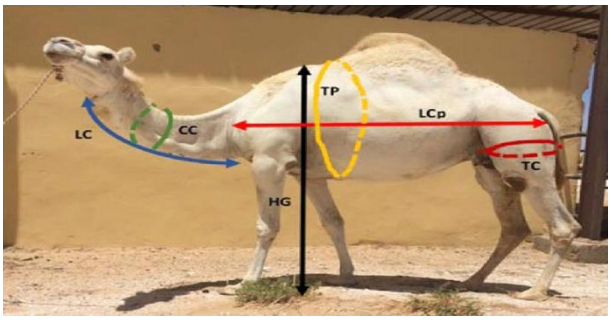


Figure 1 : Body measurements implemented on camels.

➢ **Body measurements implemented on camels**

LC: neck length; CC: neck circumference; HG: height at withers; TP: chest circumference; LCp: body length; TC: thigh circumference

NB: chest (TP) not including the bump, body length (LCp) from the shoulder tip to the ischial point of the pelvis, and thigh circumference (TC) at mid-height..

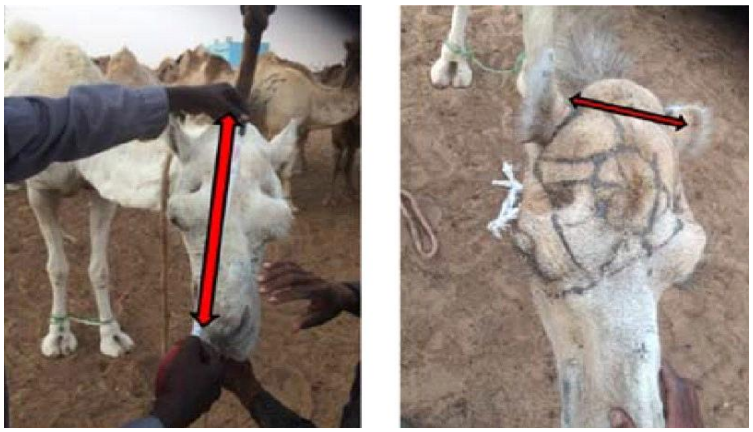


Figure 2 : Measurement of the length (left) and width (right) of the head of camels

4. MEASURMENTS ON HORSES

Live Weight (kg) = (Chest Circumference (cm)) ^{2} x Total Body Lenght (cm)/y

Notice that an Eumetric horses : horses of a size considered classic measure about **1.55 m** at the withers and weigh **500 kg.**

With **y** being a **constant** (**y = 11877.4 cm³/kg**). Rahal et al., 2009 raport on other formula :

Live Weight (kg) = (Chest Circumference (m)) ^{3} x 80

The table 1 represents the List & the description of measuremenrts carried out .

Table 1 : List and the description of measuremenrts carried out.

Type of measurement	Abbreviation	Description	Instrument
Height at the withers	**HW**	(back of the neck = weither - ground)	**T**
Height at the croup	**(HC)**	(sacred line at hip (Rump) height - floor)	**T**
Total length	**(TL)**	(shoulder tip–buttock tip)	**R**
Scapulo-iliac length	**(SIL)**	(shoulder tip–hip tip)	**R**
Length of the head	**(LH)**	(nape–upper commissure of the nostrils)	**R**
Distance between the inner corners of the eyes	**(DIE)**	(between the inner corners of the eyes)	**R**
Neck length	**(NL)**	(middle of the parotid–middle of the anterior edge of the shoulder)	**R**
Shoulder length	**(SL)**	(top–tip of the shoulder)	**R**
Length of the arm	**(LA)**	(tip of the shoulder–lateral prominence of the radial head)	**R**
Forearm length	**(FAL)**	(lateral relief of the radial head–distal part of the radius)	**R**
Cannon length	**(CL)**	(head of the metacarpal–distal end of the metacarpal at the level of the fetlock)	**R**
Thigh length	**(TL)**	measured between the crest of the greater trochanter and the top of the tibial tuberosity (10 cm above the chestnut)	**R** **R** **R**
Forearm circumference	**(FC)**	(passes through the pisiform bone, prominent bone behind the joint)	**R**
Knee circumference	**(KC)**	(perpendicular to the axis of the cannon, four fingers below the lower part of the knee)	**R**
Anterior cannon circumference	**(ACC)**		
Posterior cannon circumference	**(PCC)**	(sameTCA)	
Ilium length	**(IL)**	is measured between the anterior superior iliac spine and the crest of the greater trochanter (at the back of the weither)	**R**
Chest circumference	**(CC)**		

T: the measuring rod; R: metric tape.

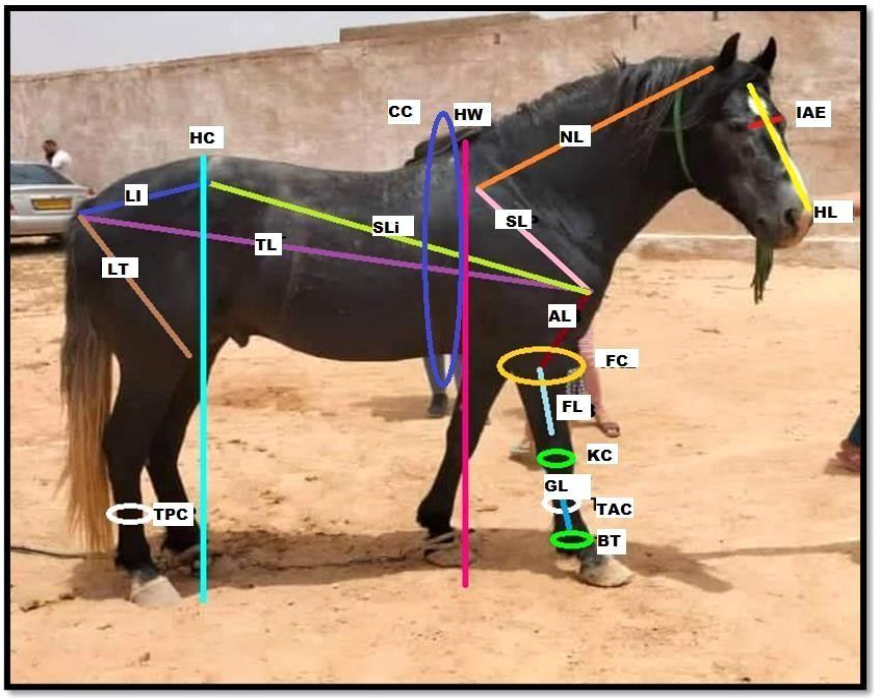


Figure 1: Original photo of the reference points defining the morphological parameters of the length of the horse (Barone,1976; Barone, 1980cité par Labbaci, 2024).

Eleven points were then highlighted (Figure 01) (Barone, 1976; Barone, 1980 cited by Labbaci, 2024):

Height at the withers (HW) =hauteur au garrot ;

Height at the rump (HR) =hauteur à la croupe;

Total Length (LT) =longueur total ;

Scapula iliac Length (SL)= ; Longueur scapula -ilium

Length of the head (HL)= ; Longueur de la tête

Length between the internal angles of the eyes (AIY) =; longueur entre les angles internes des yeux

Length of the neckline (LE); longueur du cou

Length of the shoulder (SHL); longueur de l'épaule

Length of the arm (LB) ; longueur du bras

Length of the forearm (FC) ; longueur de l'avant bras

Length of the cannon (LC) ; longueur du canon

Length of the ilium (LI) ; longueur de l'ilium

Length of the thigh (LCE) ; Longueur de cuisse

Circumference from the chest (CC)= ;Contour de la poitrine

Circumference of the forearm (TAB); Contour de l'avant bras

Circumference of the knee (TG); Contour du coude

Circumference of the ball (TB); Contour de Boulet

Circumference of the anterior barrel (TCA); Contour du canon antérieur

Circumference of the posterior barrel (CCC);Contour du canon postérieur

•THE IDEAL HORSE

The ideal horse in a square, therefore with:

LQ and **HC** identical, and the croup and the withers at the same level. So that "in the ideally proportioned horse, the height at the withers (HC) equals two and a half heads; the length of the body (LQ), two and a half heads; the thickness of the body (EC), from the middle of the belly to the middle of the back, 1 head."

One can then deduce the ratios: (LQ / HC) = 1; (LQ / LT) = 2.5; (EC / LT) = 1; (HC / EC) = 2.5. And as, according to Bourgelat, the horse's head is twice as long as it is thick, it naturally follows that (LT / ET) = 2.

Being: the Length of the Body (LQ); Thickness of the Body (EC); the Height at the Withers (HC)

5. MEMEASURMENTS ON CATTLES

Eumetric type with average animal size and format, **weight** between **600 - 700 kg** and height at withers (**HW**) equal to **1.35 m**. Various authors have established practical biometrical relationships between live weight and other body measurements.

HW: Height at withers (expressed in meters)

L: Body length (in meters)

T: Chest Circumference (girth) (in meters)

V: Ventral Circumference (girth) (in meters)

M: Sterno-iliac-ischial length (in meters).

6. CHIKEN MEASURMENTS

6.1. Study of visible characteristics

This work is based on the visual observation of chickens (the color, shape, and distribution of feathers, the shape and color of the comb, the beak, wattles, earlobes, eyes, legs, and tail) and of eggs (color and shape).

6.2. Morpho-ponderal parameters

6.2.1. Measurements taken on the hens

Figure 1: Lenght of the crest (Comb).

Figure 2: Longueur of teh beak.

Figure 3: Lenght of wings.

Figure4 : Wingspan.

Figure 5 : Body Lenght .


Figure6: Tarsus Lenght. Figure 7: Live Weight.

6.2.2. measurements taken on the eggs

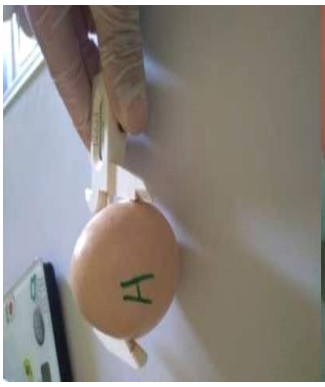
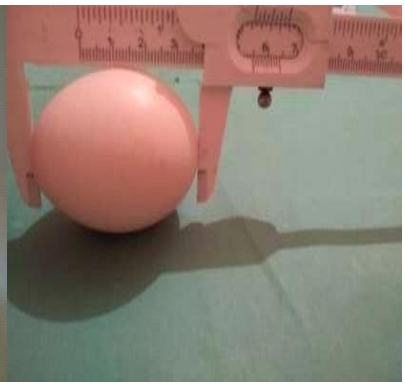




Figure8 : From the left to the right : Egg's weight, Egg's Lenght.

7. MEASUREMENTS IN DOGS (CARNIVORES)

1- Snout length: from under the eyes to the tip of the snout

2- Snout circumference: the widest part under the eyes

3- Neck circumference (upper): the highest part under the ears

4- Neck circumference (lower): the lowest part of the neck

5- Back length: from the withers to the base of the tail (the withers are on the dorsal line, at the junction of the neck and back)

6- Flank circumference: the circumference in front of the hind legs

7- Chest circumference: the widest part of the chest, between the start of the back and the withers, behind the front legs

8- Belly (Ventr) length: between the front and hind legs

9- Chest length: from the base of the neck to between the front legs

10- Withers height: from the withers to the base of the front leg

11- Front leg length: from the toe to the wrist

12- Front leg width: the widest part of the toes

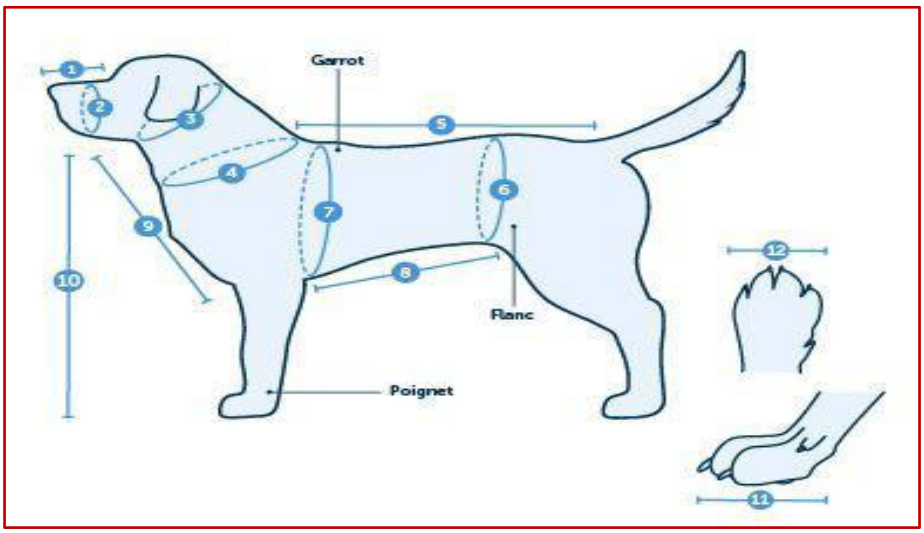


Figure 9 : Measurements on dogs

7. ZOOTECHNICAL INDEX (INDICES)

7.1. THE SIX BODYINDEX (INDICES) CALCULATED IN THE HORSE.

Table 1 shows the six calculated body indices.

Table 1: The six calculated body index.

Indices	Abbreviation
Body Index From the Profile (Side)	(HW/LT)
Body Mass Index	(CC/HW)
Compactness Index	(LW/HW)
Relative Body Index	(LT/CC)
Dactylo-Thoracic Index	(CCA/CC)
Front Rear Height Index	(HW/HC)

➢ BODY INDICES IN HORSES

From these different measurements, six body indices (Table 1) were calculated according to formulas described by several authors (Marcq et al., 1951; Chabchoub et al., 2004; Nicks et al., 2006; Boujenane et al., 2008):

INDEX OR INDICES

Body Profile Index (HW/LT); In Fr. Indice Corporel De Profil

Compactity Index (PV/HW); In Fr. Indice De Compacité

Body Ratio: chest circumference (CC)/withers height (HW); In Fr. Indice De Corpulence

Dactyl-Thoracic Index: anterior barrel circumference (TCA)/CC); In Fr. Dactylo-Thoracique

Relative Body Ratio: LT/CC;In Fr. Indice Corporel Relatif

Height Front Back: HW/ Croup height (HR); In Fr. Hauteur Devant Derrière.

7.1. DIFFERENTS INDEX IN CATTLES (BOVINE)

In practice, we use:

The Chest Index:

The Chest Index= Chest Widh / Height at the Weither

o If the index is between 0.8 and 0.9: the individual is mesomorphic;
o If the index is below 0.8: the individual is longilineal;
o If the index is above 0.9: the individual is brachylineal.

• **The body capacity index**:

Body capacity index = Scapular Ischial length/ Chest circumference

- If the index is equal to 0.9: the individual is medioline;
- If the index is greater than 0.9: the individual is longiline;
- If the index is less than 0.9: the individual is breviline.

Assessment of aptitudes

Comparisons of breeds are very difficult:

■ For milk production, high-producing breeds must have a dairy production ratio during a lactation /Live Weight ≥ 6.

The order of magnitude of production over 10 months (305 days) or a standardized (reference) lactation is **5000 kg**.

For meat production, performance is assessed through the animals' growth rate (ADG = Average Daily Gain). The order of magnitude of the average **ADG** up to 24 months is **800 g/day.**

7.2.BODY INDICES IN DOGS (CARNIVORES)

- Body condition index (dog): Chest Circumference (girth) (CC) / Withers height (WH)
- Profile body index (dog): Withers height (WH) / Total length (TL)
- Compactness index (dog): Live weight (LW) / Withers height (WH)
- Relative body index (dog): TL / CG
- Dactylothoracic index (dog): Fore Cannon Girth (CG) / Chest Girth (CG)
- Front-back height (dog): Withers Height (WH) / Rump Height (RH)

7.3.BARYMETRY (estimation of live weight) - Barymetric formulas

7.3.1.BOVINE

Marcq and L ahaye, then Leroy, reported to the breeders the simple formula of Crevat:

$$P = K\,T^{3}$$

T is the chest girth in meters; K is a coefficient that has been estimated on average at **80** but depends on the age and condition of the animals; it becomes:

- 100 for calves

- 90 for young livestock
- 85 for lean oxen (Thin)
- 80 for oxen in good condition
- 76 for medium-fat oxen
- 72 for fat oxen
- 68 for finely fattened oxen (Delage et al., 1955)

7.1.1. HORSE (EQUINE)

$$LW=CC^{3}X80$$

Bing : LW (en Kg) : LIve Weight ; CC (In Meter) Chest Circumfrence (or Girth)

7.1.2. OVINE & CAPRINE

Table 1 represents the eumetric measurements parameters
Table 1: The different heterometric classes (Cheik and Hamdani, 2007, cited by Ghani, 2016)

Female of species	Ellipometric		Eumetric		Hypermetric	
	Weither Height (WH)	Weight	Weither Height (WH)	Weight	Weither Height (WH)	Weight
Sheep	/	40kg	/	50-70kg	/	80kg

We apply this equation to estimate the Live Body Weight

$$LW= (CC^{2}X\ BL)\ /300$$

Being: LW (in Pounds): live weight; **CC** chest circumference or Girth(in Inches); BL: Body Length (in Inches) including: 1 pound = 0.454 kg; 1 inch = 2.54 cm (Anonymous 1)

NB: these formulas have limitations depending on the breeds, ages, sexes, etc.

Another formula is proposed: $\mathbf{LW = (CC^{2}X\ BL)/10832}$;

where LV is the live weight but CC, BL in cm, 10832 is a constant. **(*this formula can also have limitations*)**

7.1.3. CARNIVORES

a-1. Formula based on chest circumference or Girth (CC):

$$LW = \alpha \times (CC)^{\beta}$$

Where α et β are specific constants based on empiricals data for each species or breed and CC is Chest Circumference or girth.

b-Formula based on the scapulo-ischiale lenght (SIL) :

$$LW = \gamma \times (SIL)^{\delta}$$

Here, γ and δ are constants, and LSI represents the scapulo-ischial length.

8. THE LIMB POSITIONS

8.1. THE LIMB POSITIONS OF THE HORSE

Limb positions are the way the limbs are oriented under the horse. To judge the limb positions, the horse must be on flat ground and standing still. They are observed from the front and in profile.

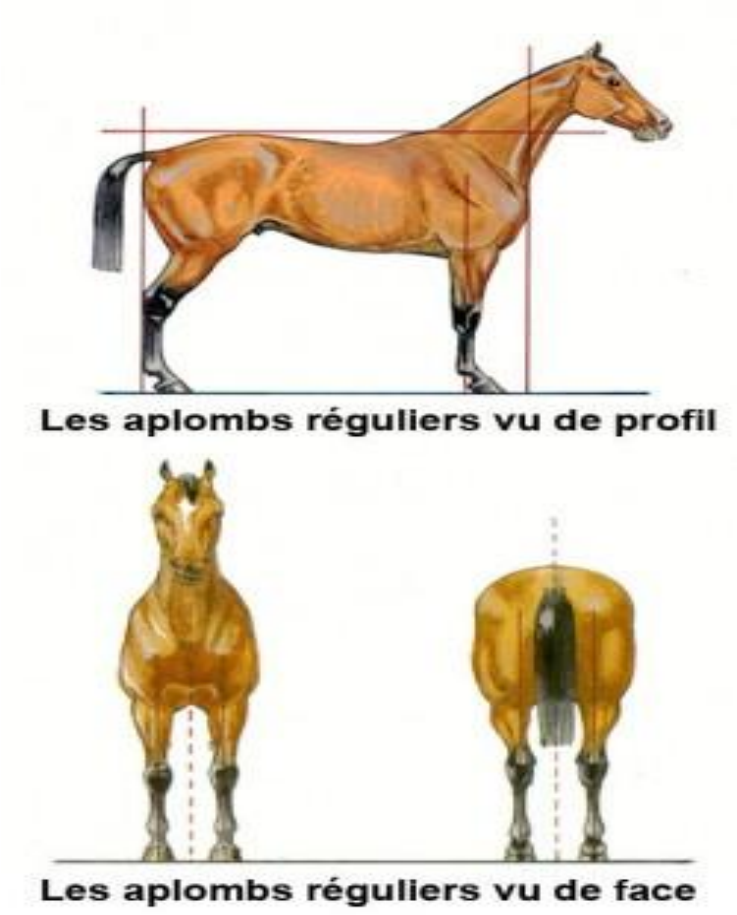
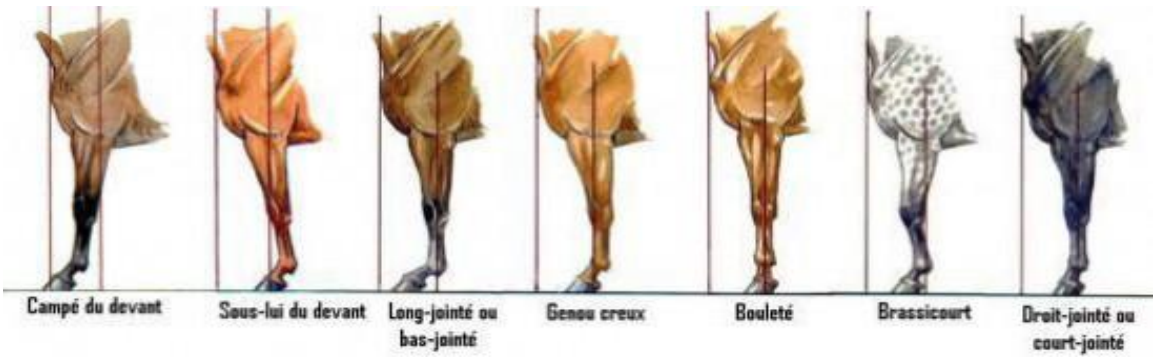


Figure 1: Regular leg alignment is the way the limbs are positioned under the horse. (regular limbs seen from the side on above and front on below)

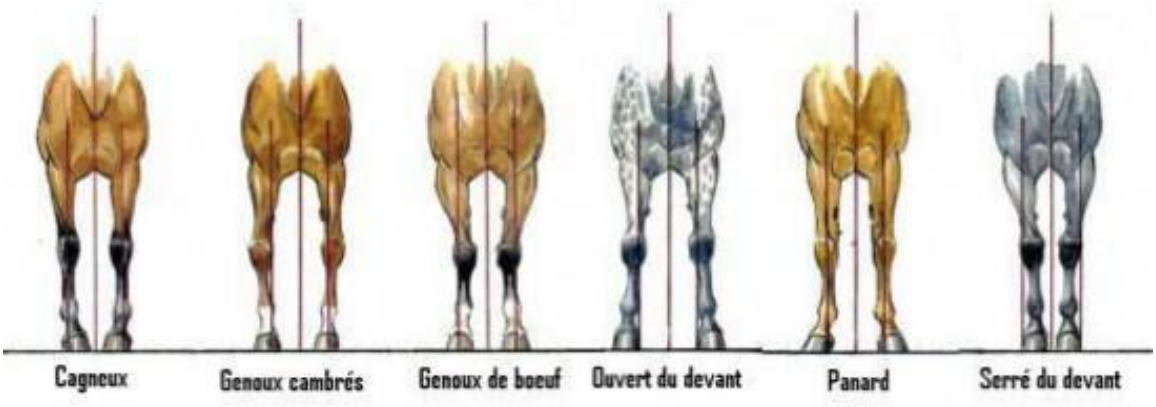
•**For the alignment to be considered regular**, it must be in the guideline (from the middle of the shoulder to the middle of the foot). If this is not the case, the alignment is considered irregular.

An irregular alignment can cause premature wear of the limb. Leg alignments have a significant influence on the horse's performance.



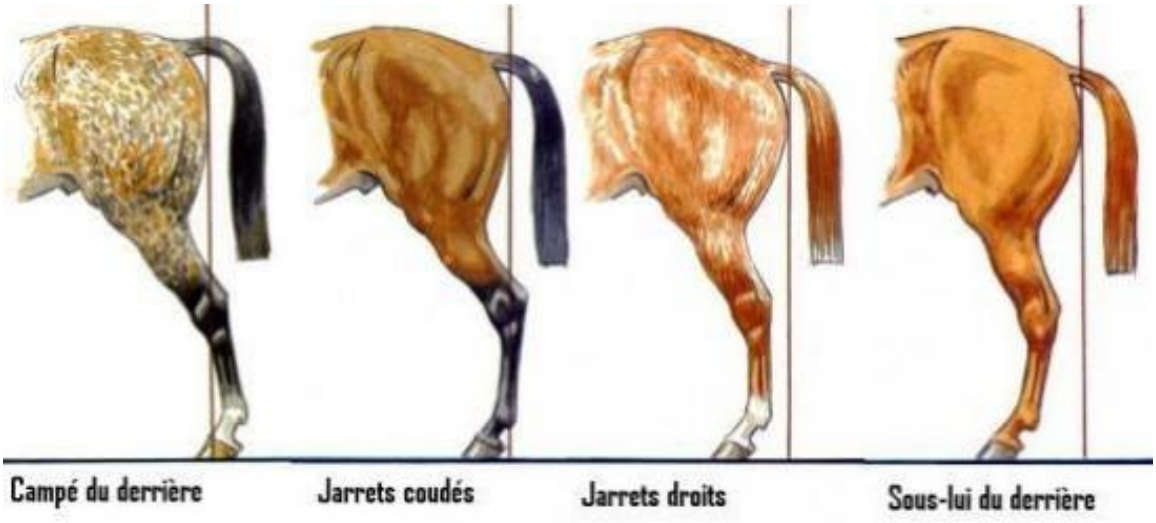
1- set forward, 2-under it forward,3- long-spaced or low-jointed, 4-hollow knee, 5-clubbed, 6-short-forelocked, 7-straight-jointed or short-jointed (from the left to the right)

Figure 2: Irregular anterior alignment seen in profile



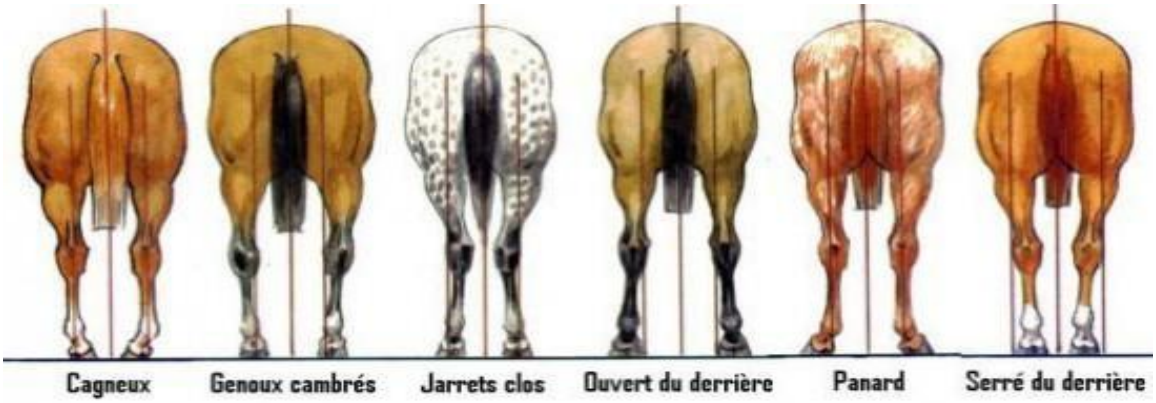
1-bow-legged, 2-arched knees, 3-beef knees, 4-opened in the front,5-pawed, 6- tight in the front (tfrom the left to the right)

Figure 3: Irregular anterior plumb lines seen from the front



1- set back on the hindquarters, -hocks bent, 3-hocks straight, 4-under him from behind (tfrom the left to the right)

Figure4 : Irregular Posterior plumbes seen in profile



1-bow-legged, 2-arched knees, 3-hocks close together, 4-open from behind, 5- pawed, 6- tight in the hindquarters (tfrom the left to the right)

Figure 5: Irregular Posterior plumbes (http://pinterest.fr cited by Khaldi and Berais, 2022)

7.2. THE DOG'S APLOMBS (ALIGNMENT, CONFORMATION)

7.2.1. Side view aplombs conformation

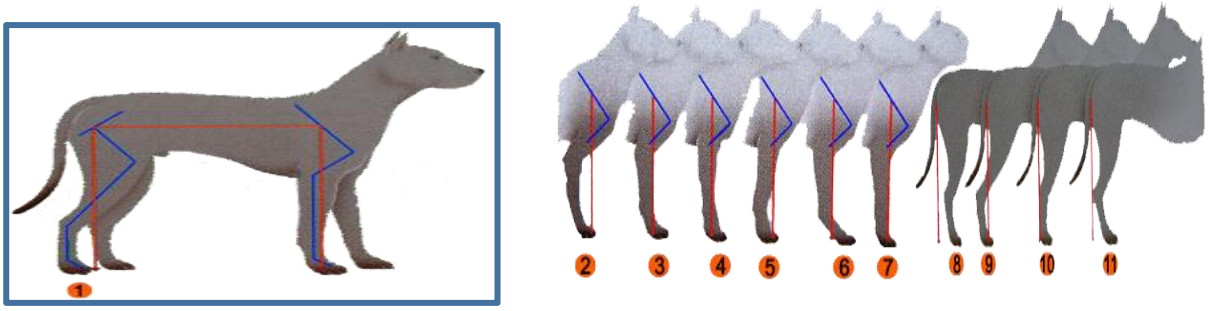


Figure 1: Aplombs (Alignment) in the profile

1-Regular alignment

2 – Under him

3 – Planted in front

4 – Carpal arch

5 – Carpal trascorvo

6 – Wide pastern halt

7 – Fetlock halt

8 – Under him

9 – Planted behind

10 – Hock halt

11 – Hocks bent

7.1.4. Alignment of the forelimbs

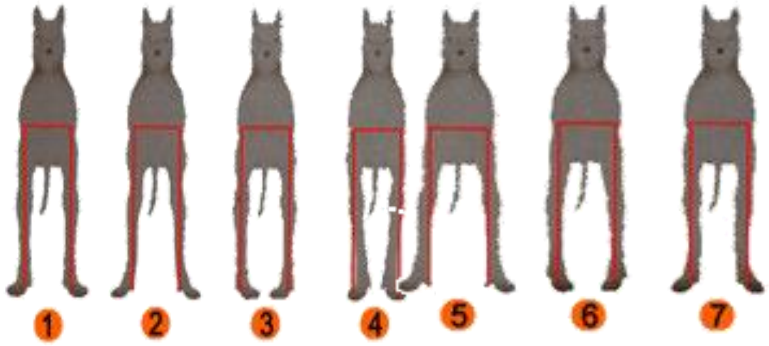


Figure 2 : Aplombs from the face (Front)

1– Regular stance

2 – Bow-legged [‘)(‘]

3 – With arched legs [‘()’]

4 – Closed in the front

5 – Open in the back

6 – Barrel with raised feet

7 – Bow-legged [‘)(‘] in the feet

7.1.4. Alignment of the hind limbs

1 – Regular alignment

2 – Closed from behind

3 – Open from behind

4 – Cow-hocked [')(‘]

5 – Bowlegged ['()’]

6 – Firm hocks, cow-hocked [')(‘] from the feet

7 – Arched, bent hocks ['()’] from the hocks

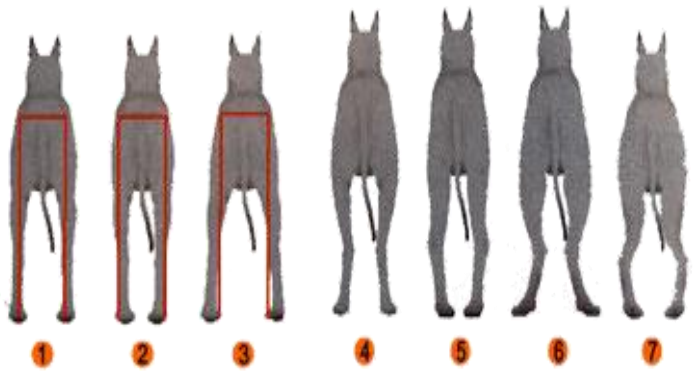


Figure 3: Rear leg alignment

REFERENCES

1. Anonyme1 : Université de l'État de Washington. extension.wsu.edu. consulté le 13/10/2024
2. Addouche F Z., Maireche S. 2021 : Caractérisation phénotypique, typologie de l'élevage caprin à l'ouest algérien. Mémoire de Master académique, Université de Tissemsilt Faculté des Sciences et de la Technologie, Département des Sciences de la Nature et de la Vie. 121 p.
3. Barone P. 1980 : Anatomie comparée des mammifères domestiques. Tome II, Arthrologie et myologie, Vigot Frères Éditeurs, Paris, France, 984 p.
4. Bensaadi M. 2016 : Caractérisations phénotypiques des populations caprines dans la région de Oued Souf. Mémoire de Master. Université Kasdi Merbah. Ouargla. 37 p.
5. Delage J., Poly J., Vissac B. 1955 : Étude de l'efficacité relative des diverses formules de barymétrie applicables aux bovins. Annales de zootechnie, 1955, 4 (3), pp. 219-231. hal-00886635.
6. Diop AKM., Mohamed S., Chrif Ahmed, Mohamed B. Biya, Mohamed Lemine Haki, Gaukhar Konuspayeva, Bernard Faye 2020 : Comparaison des phénotypes camelin Melons from Mauritania with ecotypes from Africa and Asia. Journal of Livestock and Veterinary Medicine of Tropical Countries, 2020, 73 (4): 247-254. DOI: 10.19182/remvt.31948).
7. Embarek A., Ghergoura K., Duba Chehba NE. 2020: Morphological characterization of goat populations in the Tiaret region. Ibn Khaldoun University of Tiaret, Faculty of Natural and Life Sciences, Department of Nutrition and Agro-Food Technology. Academic Master's Thesis. 38 pages.
8. Khaldi FZ., Berais F. 2022. Morphological characterization of equine breeds (Equus caballus) of Fantasia in Algeria with the establishment of a DNA biobank. Master's Thesis. Faculty of Natural and Life Sciences and Earth and Universe Sciences, Laboratory of Phthisiology, Physiopathology and Biochemistry of Nutrition. University of Tlemcen. 105 pages.
9. Laoun A., 2007, Morpho-biometric study of a sampling of a sheep population from the Djelfa region, Master's in Veterinary Sciences, Zootechnics option, Algeria, 115 pages.
10. Labbaci M., Boukraa D., Krim F., Benhammadi M., Gaouar SBS. 2024: Morphological characterization of the Fantasia horse breed in Algeria. Genet. BBiodiv. J, 2024; 8 (2): 113- 129.9.
Leroy A., Librai M. 1942: The Ox. Encyclopedia of Agricultural Knowledge. Hachette, 1942, Paris.
11. Manallah I. 2012: Morphological Characterization of Goats in the Sétif Region, Ferhat Abbas University–Setif, Master's Thesis, Faculty of Natural and Life Sciences, Department of Agronomy.
12. Marcq J., Lahay J. 1935: Cattle. Volume I: Knowledge of Livestock. Agricultural Bookstore of the Maison Rustique, 1935, Paris.
13. Martin-Rosset W. 1990: Feeding of Horses. Quae Editions, 1990, 232 p.
14. Pageat P. 2011: The Rustica Treatise on the Horse, Rustica Editions, Paris, 2011 (ISBN 978-2-874038-835-7).
15. Pigeaud R. 1997: Proportions of Horses Depicted in Paleolithic Parietal Art: Aesthetic Problem or a Matter of Perspective? In: Paléo, No. 9, 1997, pp. 295-324. doi: 10.3406/pal.1997.1238. http://www.persee.fr/doc/pal_1145-3370_1997_num_9_1_1238.
16. Rahal K., Guedioura A., Oumouna M. 2009: Morphometric parameters of the Chaouchaoua Barb horse. Rev Méd Vét. 160, 586–589.

17. Tair S. 2021: Phenotypic characterization, typology of the local chicken in western Algeria. Master's thesis. Faculty of Science and Technology, Department of Life and Natural Sciences. 69p. University of Tissemsilt.
18. . https://www.mondou.com/fr-CA/blogue/conseils/chien/comment-bien-prendre-les-mesures-de-votre-chien-ad188.html.
19. https://munsterdelavaunoise.wordpress.com/2018/11/06/laplomb-du-chien/
20. https://sevetys.fr/article/dentition-du-chien-caracteristiques-et-evolution/
21. https://fac.umc.edu.dz/vet/Cours_Ligne/cours_20_21/Zootechnie_A2/Ethnologie_Canine.pdf
22. https://www.alamyimages.fr/construction-of-a-dental-formula-of-a-dog-tooth-imagehttps444171052.html