

# ANIMAL GENETICS & BREEDING

UNIT - III

The Principles of Animal Breeding  
Theory

BREEDS OF SMALL FARM  
ANIMALS

Dr Anil Meel

Department of Animal Genetics & Breeding  
MJF Veterinary college

# BREEDS OF SMALL FARM ANIMALS

# BREEDS OF SHEEP

- Total **44 breeds** of sheep registered in India by NBAGR.
- Total sheep population in country is **74.26 million in 2019, increased by 14.13%** over previous census.
- About **13.8%** of livestock contributed by sheep.
- In sheep population-1<sup>st</sup> rank- **Telangana**
  - 2<sup>nd</sup> rank- AP
  - 3<sup>rd</sup> rank- Karnataka
  - 4<sup>th</sup> rank- Rajasthan
- In Rajasthan maximum sheep population - **Barmer**

# Crossbreeds of sheep

S.N	Crossbreed	Origin	Cross Australian Merino ram
1.	Hissardale (75%)	Govt. Livestock Farm, Hisar	Australian Merino ram x Bikaneri ewe
2.	Avikalin(50%)	CSWRI, Avikanagar	Rambouillet ram x Malpura ewe
3.	Avivastra (50%)	CSWRI, Avikanagar	Rambouillet ram x Chokla ewe
4.	Avimans (50%)	CSWRI, Avikanagar	Malpura & Sonadi x Dorset & Suffolk
5.	Avishaan	CSWRI, Avikanagar	Garole(12.5%) & Malpura (37.5%) x Patanwadi(50%)
6.	Bharat Merino(75%)	CSWRI, Avikanagar	Merino & Rambouillet x Chokla & Nali
7.	Kashmir Merino (50-75%)		Merino & Rambouillet x Gaddi, Bhakarwal & Poonchi
8.	Indian Karakul (75%)	CSWRI, Bikaner	Karakul x Marwari, Malpura & Sonadi
9.	Nilgiri Synthetic (62.5-75%)	Tamilnadu	Merino & Rambouillet x Nilgiri
10.	Patanwadi Synthetic(50%)	Dantiwara	Merino & Rambouillet x Patanwadi

# Exotic breeds of sheep

1. Fine wool breeds - Merino , Rambouillet , Polworth
2. Fur breeds - Karakul
3. Mutton breeds - Dorset , Suffolk , Southdown
4. Long coarse wool breeds - Lincoln , Leicester, Romney marsh
5. Medium wool- Hampshire , Cheviot , Corriedale

S.N.	Breed	Origin	Characters
1.	Merino	Spain	<ul style="list-style-type: none"> <li>• <b>Best fine wool breed in the world</b>, Ewes polled &amp; rams have spiral horns.</li> <li>• <b>Wool blindness.</b></li> </ul>
2.	Rambouillet	Rambouillet (France )	Developed from Spanish Merino.
3.	Lincoln	England	<b>Largest &amp; heaviest breed in the world.</b>
4.	Leicester	England	<b>Purest English breed.</b>
5.	Southdown	England	<b>Mousey grey face, Oldest English breed.</b>
6.	Karakul	Bukhara province of <b>Uzbekistan</b> (Central Asia)	<b>Best pelt (good quality fur )</b> producing breed in the world.
7.	Suffolk	England	<b>Best mutton breed.</b>
8.	Dorset	England	

# Based on utility

- **Apparel wool**-Kashmir merino, Nilgiri, Avivastra, Bharat merino, Karnah, Nali, Chokla, Gurez, Changthangi, Gaddi, Magra, Sonadi
- **Carpet wool**- Chokla, Nali, Patanwadi, Tibetan, Avikalin, Poonchi, Chottanagpuri, Jaisalmeri, Pugal, Bhakarwal
- **Meat and carpet**- Muzaffarnagari, Jalauni, Deccani, Bellary, Ganjam, Balangir, Shahbadi, Madras red, Trichi black, Kanguri
- **Meat** – Nellore, Mandya, Hassan, Mecheri, Ramnad, Kilakarsal, Vembur
- **Meat, Wool, and Milk**- Sonadi, Marwari

# Breeds of Sheep in different agro-ecological regions in India

North Temperate	North-Western Arid and Semi Arid	Southern Peninsular	Eastern
1. Bhakarwal 2. Changthangi <b>3. Gaddi</b> <b>4. Gurez</b> 5. Karnah 6. Poonchi <b>7. Rampur Bushair</b>	<b>1. Chokla</b> <b>2. Jaisalmeri</b> 3. Jalauni 4. Panchali <b>5. Magra</b> <b>6. Malpura</b> <b>7. Marwari</b> 8. Muzaffarnagari <b>9. Nali</b> 10. Patanwadi <b>11. Pugal</b> <b>12. Sonadi</b> <b>13. Kajali</b>	1. Bellary 2. Coimbatore 3. Deccani 4. Hassan 5. Kenguri 6. Kilakarsal 7. Madras Red 8. Mandya 9. Mecheri <b>10. Nellore</b> 11. Nilgiri 12. Ramnad White 13. Tiruchi Black 14. Vembur 15. Chevaadu 16. Katchaikatty	1. Balangir 2. Bonpala 3. Chottanagpuri <b>4. Ganjam</b> <b>5. Garole</b> 6. Tibetan 7. Shahbadi 8. Kendrapada



S. N.	BREED	SYNONYMS	ORIGIN & DISTRIBUTION	CHARACTERS
1.	CHOKLA	Raata munda, Shekhawati, Indian Merino	Sikar, Churu, Jhunjhunu (Rajasthan)	<ul style="list-style-type: none"> <li>• <b>Finest wool among all Rajasthan breeds.</b></li> <li>• Roman nose.</li> <li>• Head small with brown color.</li> </ul>
2.	NALI		Ganganagar, Churu, Jhunjhunu (Rajasthan)	<ul style="list-style-type: none"> <li>• <b>Canary coloration</b> of wool.</li> <li>• Night grazing and stubble grazing.</li> </ul>
3.	MARWARI		Marwar region (Rajasthan)	<ul style="list-style-type: none"> <li>• <b>Highest disease resistant.</b></li> <li>• <b>Triple</b> purpose sheep breed.</li> </ul>
4.	MAGRA (Bikaneri)		Bikaner, Jaisalmer	<ul style="list-style-type: none"> <li>• Light <b>brown patches around the eyes</b> , characteristics of this breed.</li> </ul>
5.	JAISALMERI		Jaisalmer, Barmer, Bikaner, Jodhpur	<ul style="list-style-type: none"> <li>• Roman nose</li> </ul>
6.	PUGAL		Bikaner	<ul style="list-style-type: none"> <li>• <b>Yellow streak above the eyebrow.</b></li> <li>• Lower jaw typically light brown.</li> </ul>

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTERS
7.	SONADI (Chanothar)	Udaipur	<ul style="list-style-type: none"> <li>• <b>Milker sheep</b></li> <li>• Long ear that touch the ground during grazing.</li> </ul>
8.	NELLORE	Nellore (Andhra Pradesh)	<ul style="list-style-type: none"> <li>• <b>Tallest breed</b> of sheep in India.</li> <li>• <b>Best Mutton</b> breed of India.</li> <li>• Also known as “ <b>goat like sheep</b>”.</li> </ul>
9.	MANDYA (Bannur)	Karnataka	<ul style="list-style-type: none"> <li>• <b>Smallest sheep</b> breed.</li> <li>• U shape conformation from the rear.</li> </ul>
10.	GAROLE	Sundarban (WB)	<ul style="list-style-type: none"> <li>• <b>Most prolific</b> sheep breed of India.</li> </ul>
11.	GADDI	Kullu & Kangra Valleys (HP)	<ul style="list-style-type: none"> <li>• <b>Very sturdy &amp; very good climber.</b></li> <li>• Polled ewes &amp; horned rams.</li> <li>• Undercoat used for making “ <b>Kullu shawls</b>” &amp; <b>blankets.</b></li> </ul>
12.	BHAKARWAL	Udhampur, jammu, rajouri dist. Of J&K.	<ul style="list-style-type: none"> <li>• Rams horned but ewes hornless.</li> <li>• “<b>Loei</b>” is obtained from this breed.</li> </ul>

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTERS
13.	GUREZ	Baramulla dist. Of J &K	<b>Biggest among Kashmir breeds.</b> Ewes are good milkers.
14.	GANJAM	Ganjam (Orissa)	
15.	MALPURA	Jaipur, Ajmer, Tonk	
16.	MUZZAFARNAGARI	Muzzaffarnagar, Meerut, Binjor (UP)	Tail is extremely long & reaches fetlock.
17.	RAMPUR BUSHAIR	Kinnapur, Shimla, Lahul, spiti (HP)	
18.	JALAUNI	MP	
19.	DECCANI (Deshi)	Maharastra, Andhra Pradesh	
20.	BALANGIR	Orissa	
21.	BELLARY	Karnataka	

22.	BONPALA (Banpala, Gharpala)	Sikkim	
23.	CHANGTHANGI	J & K	Changluk, Huniya
24.	CHEVAADU (Archievaadu)	Tamilnadu	Light brown, some are dark brown and few tan.
25.	CHOTTANAGPURI (Gareri)	Jharkhand, WB	
26.	COIMBATORE	Tamilnadu	
27.	HASSAN	Karnataka	
28.	KAJALI(Kali kajali, Chitti kajali)	Punjab	Roman nose, long pendulous ear , long tail touching the ground.
29.	KARNAH	J & K	
30.	KATCHAIKATTY BLACK	Tamilnadu	
31.	KENDRAPADA	Odisha	Brown color, horizontal ears.(Desi , Kuzi)
32.	KENGURI	Karnataka	<b>Body color is dark brown or coconut colored.</b> Some of kenguri sheep have black belly k/a <b>JODKA.</b>
33.	KILAKARSAL	Tamilnadu	Keethakkaraisal, Karuvai, Keezha

34.	MADRAS RED (Chennai sigappu)	Tamilnadu	
35.	MECHERI	Tamilnadu	Body color is light tan.
36.	NILGIRI	Tamilnadu	
37.	PANCHALI( Baraiya, Dooma, Dumma, Panchali-Dumma)	Gujarat	
38.	PATANWADI (Kutchi, Kathiawari, Vadhiyari,Charotari)	Gujarat	Ears with hairy tuft. The migratory sheep have larger body and long legs.
39.	POONCHI	J & K	
40.	RAMNAD WHITE	Tamilnadu	
41.	SHAHBADI	Bihar	<b>Fleece color is mostly grey</b> , sometimes with black spots.
42.	TIBETAN	Arunachal pradesh	
43.	TIRUCHI BLACK (Tiruchirappalli, Karungurumbai)	Tamilnadu	Body is completely black.
44.	VEMBUR (Karandhal)	Tamilnadu	<b>Body color is white with fawn to black patches all over the body.</b>



Chokla



Pugal



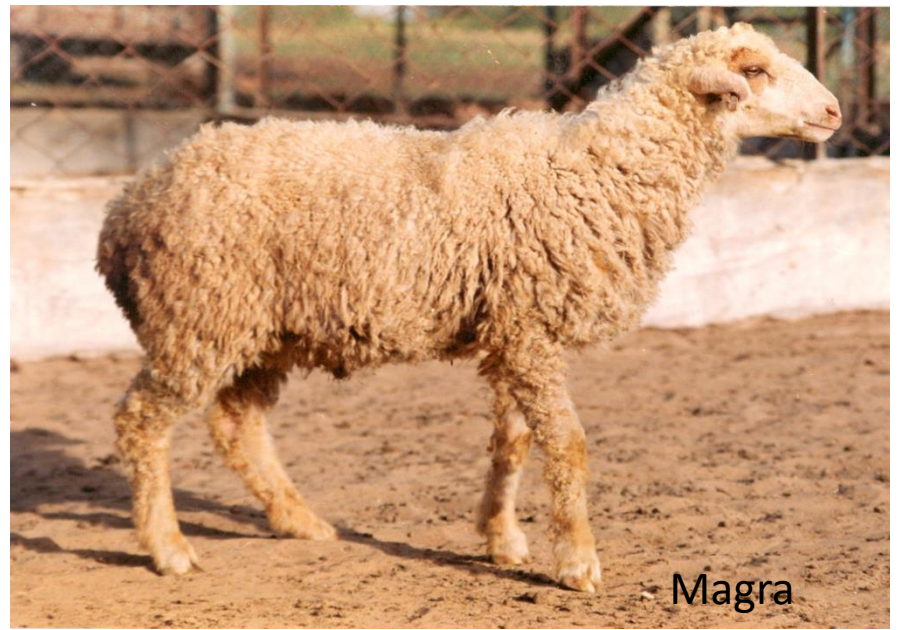
Nali



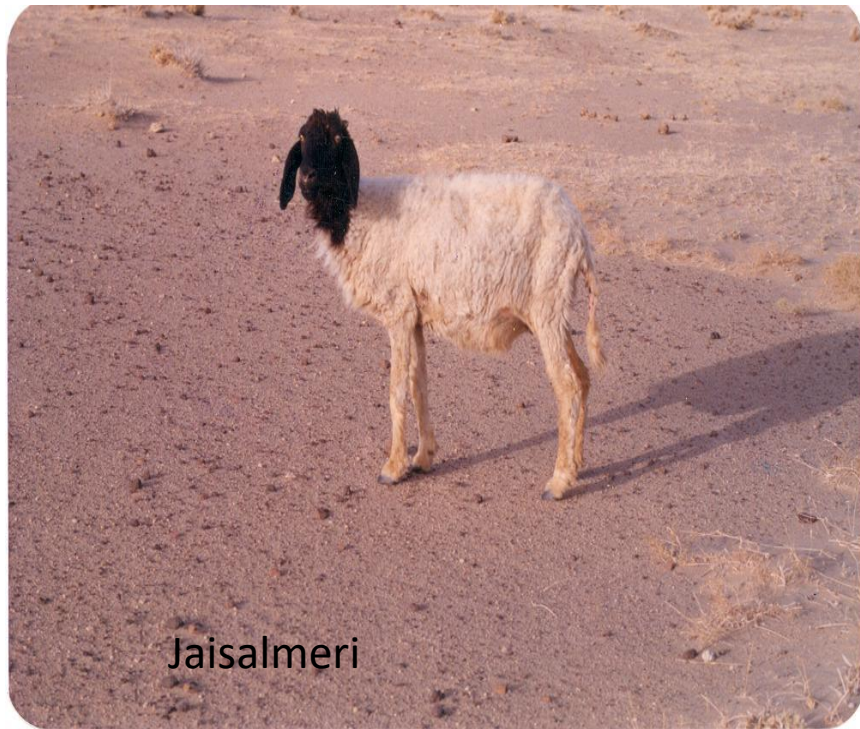
Marwari



Malpura



Magra



Jaisalmeri



Sonadi



Nellore



Mandya



Gaddi



Garole





Kajali



Bhakarwal



Mujzzafarnagri



Gurez

# BREEDS OF GOAT

- Total 34 breeds of goats registered in India by NBAGR.
- Total goat population in the country is **148.88 million** during 2019 **increased by 10.14%** over previous livestock census (2012).
- About **27.8%** of total livestock is contributed by goats.
- In goat population 1<sup>st</sup> rank-**Rajasthan**
  - 2<sup>nd</sup> rank- WB
  - 3<sup>rd</sup> rank- UP
- Maximum goat in Rajasthan in **Barmer** district.

# Exotic breeds of Goat

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTERS
1.	Saanen	Switzerland	<ul style="list-style-type: none"> <li>• <b>“Milk queen”</b></li> </ul>
2.	Alpine	Africa	
3.	Angora	Turkey	<ul style="list-style-type: none"> <li>• <b>“Mohair”</b> (white soft silky hairs) producing breed.</li> <li>• AKA <b>“sheep like goat”</b></li> </ul>
4.	Anglo – Nubian	England	<ul style="list-style-type: none"> <li>• Roman nose, AKA <b>Jersey of goat(fat% high)</b></li> <li>• Most outstanding <b>dual-purpose</b> breed.</li> <li>• Widely used for <b>upgrading of desi stock.</b></li> </ul>
5.	Toggenberg	Switzerland	<ul style="list-style-type: none"> <li>• Horn absent, <b>maximum adaptability</b> in exotic breeds.</li> </ul>
6.	Boer	Southern Africa	<ul style="list-style-type: none"> <li>• Meat type breeds used for crossbreeding for meat.</li> </ul>
7.	Orenberg	Kazakhstan	

# Classification Indian goat breeds based on utility

Meat & Skin	Meat, Milk & Skin	Meat, Hair & Skin	Meat, Pashmina & Skin	Milk, Meat & Skin
Black Bengal	Barbari	Bakharwal	Chegu	Beetal
Ganjam	Tellicherry (or) Malabari	Gaddi (Chamba)	Changthangi	Jamunapari (Etawah)
Kannai Adu	Osmanabadi	Gohilwadi		
	Sirohi	Kangan		
	Surti	Kutchi		
	Mehsana	Marwari		
	Zalawadi	Sangamneri		
	Jhakhrana	Khasi (Assam hill goat)		

## Classification of goat breeds based on agro-ecological regions in India

Northern temperate region	North-western, central arid and semi arid region	Southern peninsular region	Eastern region
Gaddi	Sirohi	Sangamneri	Ganjam
<b>Changthangi</b>	Marwari	Malabari	<b>Black Bengal</b>
<b>Chegu</b>	<b>Beetal</b>	Osmanabadi	Assam Hill
Bhakarwali	<b>Jhakrana</b>	Kanni Adu	Sumi-Ne
	<b>Barbari</b>	Kodi Adu	
	<b>Jamnepari</b>	Salem black	
	Mehsana	Berari	
	Gohilwadi	Konkan Kanyal	
	Zalawadi	Bidri	
	Kutchi	Nandidurga	
	Surti	Attapady	
	Kahmi	Teressa	
	Pantja		
	Rohilkhandi		

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTER
1.	Barberi	Etawah, Agra(UP) Bharatpur (Raj.)	<ul style="list-style-type: none"> <li>Origin- Barbera city (East Africa)</li> <li><b>Dwarf breed</b> highly susceptible for stall feeding&amp; generally found in cities so AKA <b>city breed</b>.</li> <li>Indian goat with <b>maximum milk fat(5%)</b>.</li> </ul>
2.	Jhakrana	Alwar (Raj.)	<ul style="list-style-type: none"> <li>Skin popular for <b>tanning purpose</b>.</li> </ul>
3.	Sirohi	Rajasthan & Gujarat	
4.	Marwari	Rajasthan	<ul style="list-style-type: none"> <li>Dual purpose breed.</li> </ul>
5.	Kutchi	Kutch (Gujarat)	<ul style="list-style-type: none"> <li><b>Corkscrew shape horns</b>.</li> </ul>
6.	Mehsana	Gujarat	
7.	Surti	Gujarat	<ul style="list-style-type: none"> <li>Dairy goat breed mainly raised for milk production.</li> </ul>
8.	Jamunapari	Etawah, Agra (UP)	<ul style="list-style-type: none"> <li><b>Biggest and most majestic</b> breed of India.</li> <li><b>Roman nose</b> (Parrot mouth appearance)</li> <li>Most <b>beautiful Indian dairy</b> goat.</li> <li><b>Creamy white body</b> color with shining hair.</li> <li>Thick growth of hairs on buttocks k/a <b>feathers</b>.</li> </ul>

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTER
9.	Pantja	Uttarakhand & UP	
10.	Rohilkhandi	UP	
11.	Beetal	Punjab	<ul style="list-style-type: none"> <li>• <b>Buck possesses marked beard but females are beardless.</b></li> <li>• <b>Roman nose</b></li> </ul>
12.	Black Bengal	WB	<ul style="list-style-type: none"> <li>• <b>Best chevon breed of India.</b></li> <li>• <b>Highly prolific goat breed of India</b></li> </ul>
13.	Chegu	Himachal pradesh	<ul style="list-style-type: none"> <li>• Pashmina producing breed.</li> </ul>
14.	Changthangi (Pashmina)	J&K	<ul style="list-style-type: none"> <li>• <b>Pashmina producing breed</b></li> <li>• Pashmina used for making high quality Kashmiri <b>“Rug or Shawl”</b>.</li> </ul>
15.	Gaddi	HP	
16.	Bhakarwali	J&K	
17.	Tellicheri ( Malbari)	Kerala	Reared for meat purpose.
18.	Osmanabadi	Maharashtra	Good quality meat and skin.



S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTER
19.	Zalawadi (Tara bakari)	Gujarat	Used for milk, meat, and fibre production.
20.	Attapady	Kerala	
21.	Ganjam	Orissa	
22.	Gohilwadi	Gujarat	
23.	Kanni Adu	Tamilnadu	
24.	Sangamneri	Maharashtra	
25.	Konkan Kanyal	Maharashtra	
26.	Berari	Maharashtra	
27.	Teressa	Andaman & Nicobar	
28.	KodiAdu	Tamilnadu	

S.N.	BREED	ORIGIN & DISTRIBUTION	CHARACTER
29.	Salem Black	Tamilnadu	
30.	Sumi-Ne	Nagaland	
31.	Kahmi	Gujarat	
32.	Assam Hill	Assam & Meghalaya	
33.	Bidri	Karnataka	
34.	Nandidurga	Karnataka	



Barberi



Black Bengal



Changthangi



Chegu



Jamunapari



Jhakrana



Beetal female and male

# BREEDS OF PIG

- Total 10 breeds of pigs registered in India by NBAGR.
- Total pig population in the country is **9.06 million** during 2019 **decreased by 12.03 %** over previous livestock census (2012).
- About **1.69 %** of total livestock is contributed by pigs.
- In pig population 1<sup>st</sup> rank- Assam  
2<sup>nd</sup> rank- Jharkhand  
3<sup>rd</sup> rank- Meghalaya

# Exotic Breeds of Pigs

S.N.	BREED	HOME TRACT	CHARACTER
1.	Large White Yorkshire	England	<ul style="list-style-type: none"><li>• <b>Heaviest breed</b> of pig.</li><li>• Known as <b>mother breed</b>.</li><li>• Most prolific breed.</li></ul>
2.	Middle White Yorkshire	England	<ul style="list-style-type: none"><li>• <b>Excellent pork breed</b>.</li></ul>
3.	Berkshire	England	<ul style="list-style-type: none"><li>• Black color with 6 white marks on body.</li><li>• Erect ears.</li></ul>
4.	Tamworth	England	<ul style="list-style-type: none"><li>• <b>Golden red</b> color body.</li><li>• Large, long, tall breed known for <b>lean meat</b>.</li></ul>
5.	Landrace	Denmark	<ul style="list-style-type: none"><li>• <b>Highest quality bacon</b> in the world.</li><li>• White colored breed with some black skin spots known as <b>“freckles”</b></li></ul>
6.	Chester white	U.S.A	<ul style="list-style-type: none"><li>• Known to produce large litters.</li></ul>
7.	Duroc	U.S.A	<ul style="list-style-type: none"><li>• Meat type Hog.</li></ul>
8.	Hereford	Missouri	<ul style="list-style-type: none"><li>• Developed from cross of Berkshire &amp; Duroc.</li><li>• Dwarf breed</li></ul>
9.	Hampshire	U.S.A	<ul style="list-style-type: none"><li>• Meat breed.</li></ul>
10.	Polland China	U.S.A	<ul style="list-style-type: none"><li>• Noted for ability to easily gain weight.</li></ul>

# Indian breeds of pigs

S.N.	BREED	HOME TRACT
1.	Ghoongroo	WB
2.	Niang Megha	Meghalaya
3.	Agonda Goan	Goa
4.	Tenyi Vo	Nagaland
5.	Nicobari	Andaman & Nicobar
6.	Doom	Assam
7.	Zovawk	Mizoram
8.	Ghurrah	UP
9.	Mali	Tripura
10.	Purnea	Bihar & Jharkhand



# BREEDS OF RABBIT

# Common Rabbit Breeds Available in India

- At present, there are 38 breeds and 19 strains of domestic rabbits throughout the world recognized by American Rabbit Breeder Association (ARBA).
- Only 8-10 breeds of rabbits are available in India predominantly in Himachal Pradesh, Uttar Pradesh, Rajasthan, Goa, Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, West Bengal, Meghalaya, and Tripura.

## **New Zealand White**

This is one of the best meat breed. It is medium sized and developed in UK. It had three varieties i.e. White, Black and Red. Adult buck and doe weighs 3.7 – 4.0 kg and 4.0 - 4.2 kg respectively.

## **Soviet Chinchilla**

It has a compact, medium body and it is meat type. It has one variety i.e. gray. Adult buck and doe weighs 2.5 - 3.5 kg and 3.0 – 3.6 kg respectively.

## **Flemish Giant**

It is the largest of the domestic breeds and has a well proportioned and balanced body. It is meat type breed. It is originated in the UK. It has seven varieties i.e. Steel gray, Black gray, Sandy, Black, Blue, White and Fawn. Adult buck and doe weigh 5.0 kg and 5.4 kg respectively.

- **British Angora**

Developed in Angora town of Turkey. It is wool breed. It has a much fine coat. It has two varieties i.e. White and coloured. Adult buck and doe weighs 2.4 - 3.4 kg and 2.5 – 3.6 kg respectively.

- **French Angora**

It has longer and narrower head and a large body than British Angora. It is wool breed. It has two varieties i.e White and coloured. Adult buck and doe weighs 3.0 and 3.2 kg respectively.

## **Satin**

The Satin originated in the USA. It is meat breed. It has six varieties i.e. Black, Blue, Chocolate, Copper, Red Siamese and White. Adult buck and doe weighs 3.5 - 4.0 kg and 4.0 – 4.5 kg respectively.

## **Californian white**

It is a meat type rabbit developed in California from Himalayan and Standard Chinchilla cross. F-1 male was crossed with NZW female to develop this. Adult buck and doe weighs 3.6 - 4.5 and 3.9 - 4.8 kg respectively. The color is all white with black, chocolate, blue or lilac nose, ears, feet, and tail.

Strain	Origin	Use
New Zealand White	UK	Meat type
Soviet chinchilla	Russia	Meat type
Flemish giant	UK	Meat type
British angora	Turkey	Wool type
French angora	Turkey	Wool type
Satin	USA	Meat type
Californian white	California	Meat type

Breeding system

# Selection of male and female

**Female selection**: adult female animal are culled for a number of reason like-

1. Late maturity
  2. Reproductive problems
  3. Udder problem
  4. Uterovaginal disorders and
  5. For low milk production.
- The dairy females are selected for-
    1. Increase in milk production
    2. Low age at first calving
    3. Shorter service period
    4. Normal lactation length etc.
  - The final selection based on the expected producing ability(EPA) or on breeding value.
  - EPA is estimated by the most probable producing ability(MPPA).
  - $EBV = h^2(\bar{X}_c - \bar{X})$  for single record.
  - $EBV = h^2(\bar{x}_c - \bar{x}) \frac{n}{1+(n-1)r}$  for more record



# Male selection

- The individual selection is not possible in case of male .
- Males are selected on the basis of the performance of their relatives.
- Selection of sire is important rather than the dam.
- Dam leave limited no. of progeny whereas sire leave more no. of progeny thus sire has greater impact on the herd so it is called half of herd.
- Only few sires are needed for breeding a herd hence selection is more intense among the females.
- Sire selection criteria:- 3 steps
  1. Selection of male based on pedigree.
  2. Preliminary selection of males.
  3. Progeny testing

# Reproductive parameters of sheep and goat

- Breeding age- 6-8 months
- Comes to heat after lambing – 21 days after
- Length of pregnancy - 147 days (mutton breed 144-147 and wool breed 148-152 days)
- Male female ratio - 1:30
- Estrous cycle is repeated every 17 days on average in ewes.
- Estrous cycle is 19 days in does (range 17-24 days).
- The estrous period lasts for about 24-36 hours in ewes and 34-38 hours in does.

# Methods of mating

## 1. Hand mating

- By this method the ewes in estrus are first detected by the vasectomized rams which are then picked up and kept in the breeding pen and served by selected proven sires.
- Extremely useful for any experimental farm.

### **Merits**

- This method ensure the expected time of lambing / kidding. This system allows the farmer to know that the animal has actually bred.
- This system reduces the risk of injuries to the animals.
- It is beneficial when mating older male with a younger female.
- It also improves the breeding efficiency of male, resulting in an increased number of females that can be bred in shorter period of time.

## **2. Pen mating**

- In this mating system the ewes/does are divided into batches varying from 20 to 25 ewes/does.
- Males are turned into the flock only during the night time and separated during day time.

### **Merits**

- This system of mating prevents the disturbances to the ewes/does by the male during grazing hours.
- Males are also given enough rest and they can be fed properly.

### **3. Flock mating/pasture mating**

- In this system rams are usually let loose the ewes to serve at will (during day and night)during the mating season at the rate of 30-45 ewes per ram.
- This is the most common practice followed by all commercial flock owners.

#### **Demerits**

- The ram or buck sometimes may develop attraction for particular ewe or doe in heat and serve it a number of times while other remains unattended resulting in empty ewes/does and low fertility rate.
- The ram/buck some time exhaust itself overnight by serving more than a dozen times and the last served ewes or does not receive optimum number of spermatozoa and remain unconceived.

#### **4. Artificial insemination**

- Artificial insemination offer the best means of distributing germplasm from nucleus breeding flock to many small flocks within each eco system.
- Fresh as well as frozen semen is used.
- The speculum method of insemination is used for ewes and does.
- Generally artificial insemination leads to lower reproductive rate than natural service and frozen semen gives even much low pregnancy rate that is around 40%.
- Cervical insemination is generally followed for better conception rate.

## **Other methods**

- Pure breeding
- Inbreeding
- Outbreeding
- Cross breeding

## **In pig breeding system-**

- Pure breeding
- Cross breeding

**THANK YOU**