INTRODUCTION TO ANIMAL BREEDING

- The population explosion and a poor distribution of food are among the world's greatest problems today. Animals throughout the world supply human beings with milk, meat, egg, draft power, transportation, hides, fertiliser and many other useful products. Therefore, animal breeding is the beginning or the foundation to meet out the requirement. Hence, it behoves agriculturists and livestock breeders especially to give special attention to their programme of animal breeding.
- Animal breeding is a fascinating discipline. It has long been recognised as one branch of arts and only recently it started to be recognised as a special branch of science. It is also one of the steps in the process of animal production, but it is the first step and fundamental to a sound animal husbandry. Application of improved methods of breeding, feeding, management and disease control during the last few decades has greatly increased the efficiency of production.
- Animal breeding is the application of genetics and physiology of reproduction to animal improvement. The purpose of animal breeding is not only to genetically improve individual animals but to improve whole animal population *i.e.* to improve future generations of animals. To achieve this, the breeder is provided with two important tools: **Selection** and **Breeding**. These two tools are the decision making in livestock improvement.
- Selection decides which animals are going to become parents to produce offspring for the future generation and breeding decides which males should be mated with which females. Therefore improvement in type, production, longevity, regularity of breeding etc. as well as the ability to transmit these desirable qualities to many progenies can be expected through application of proper selection and systems of breeding.

Important Institute:

- Realizing the importance of the livestock, the Govt. of India under the Ministry of Agriculture has created an autonomous body namely ICAR (Indian Council of Agricultural Research) to conduct research on various aspects of livestock production and health. There are 10 research institutes directly under the control of ICAR, which undertake research on various species of livestock. The institutes are:
  1. National Bureau of Animal Genetic Resources (NBAGR), Karnal, Haryana.
  2. Central Sheep and Wool Research Institute (CSWRI), Avikanagar, Rajasthan.
  3. Central Institute for Research on Buffaloes, Hissar, Haryana.
  4. Central Institute for Research on Goats, Mukdoom, UP
  5. Central Avian Research Institute (CARI), Izatnagar, Uttranchel.
  6. National Equine Research Centre, Hissar, Haryana.
  7. National Camel Research Centre, Bikaner, Rajasthan.
  8. Indian Grass land and Forage Research Institute, Jansi, UP
  9. ICAR North Eastern Hill Complex, Shillong, Megalaya.
  10. National Research Centre on Yak, Dirang, Arunachal Pradesh
- In addition, there are State Agricultural Universities, Deemed to be Universities, Veterinary and Animal Sciences Universities, Indian Veterinary Research Institute, Izatnagar and National Dairy Research Institute, Karnal conducting research in animal production and health with the help of ICAR.

DOMESTICATION OF LIVESTOCK

- Man domesticated animals since they have provided him with meat and milk for table, skin for clothing and power for tillage and transport. As civilisation developed, food became more abundant and methods of livestock rearing improved the latent possibilities for rapid growth in body size and milk production began to be realised under man's selection.
- Without agriculture and animal husbandry, there could have been no civilisation. The domestication of animals provided the foundation on which civilisation could be built. Most of the animals currently husbanded by man were domesticated in Neolithic times with the exception of dog that was used in the earlier Palaeolithic era.
- Domestication began at the end of Old Stone Age and received decided impetus during the New Stone Age. During New Stone Age, man conceived the idea of domesticating plants and animals to increase and ensure his food supply and this was the greatest turning point in man's long history. The exact time and places of domestication are not known. It might have taken place simultaneously and independently in several

regions. It probably occurred 8,000 to 10,000 years ago in Asia possibly around Mediterranean sea (Egypt) or even in Europe.

- Domestication of animals carried out for
  - Religious rites (as sacrifice to the God)
  - Gratifying his economic needs (meat & milk for table and wool & skin for clothing)
  - Companionship

Stages of domestication

- Free range
- Confined with human environment but at random
- Specific breeding pattern to produce progeny
- Planned development of breeds with traits he desired in them

Effects and consequences of domestication

- Domestication led to changes in characteristics of animals domesticated, conditioned by functions for which man domesticated them, *i.e.*, in terms of size, colour, hair, body structure etc. It led to better feeding and caring of animals, selection and rearing of more profitable animals and better breeding.

Order of domestication

1	Pre-agricultural period	Dog, Goat and Sheep
2	Early agricultural period	Cattle, Buffalo, Yak and Pig
3	Transport and labour	Elephant, Horse, Camel and Ass
4	Pest destroyers	Mongoose, Ferret and Cat

Other animals

- Dog was the first animal tamed by man for the sake of companionship and followed by cattle, sheep and goats. Horse was probably the last to be domesticated.

1	Chicken and Elephants	First domesticated in India
2	Swine	China
3	Horses	Eastern Europe and West Asia
4	Guinea pigs and Turkey	America

- Dog
  - They are represented in Egyptian monuments as early as 3400 B.C.
- Cattle
  - Domesticated as early as early as 2100 B.C. Evidences from tombs and caves of Egypt also confirmed that cattle were slaughtered for meat. The Mohenjo-Daro seal with a bull known around 2500 B.C makes it almost certain that Indian Cattle (Zebu) originated in India.
  - Cow was a very important animal in Greek mythology and was a sacred animal in many older civilisations. They were mainly used for food, draft and tillage. All the present day breeds of cattle

derived from *Bos taurus* (European Cattle), *Bos indicus* (Indian Cattle) *and Bos longifrons* (African Cattle).

- Buffalo (*Bubalus bubalis)*
  - Buffalo was originally confined to India and Sri Lanka; reared for food and skin.
- Sheep (*Ovis aries)*
  - Domestic sheep was originated in Europe and cooler regions of Asia. Sheep was originally a hairy animal with an under fur of wool.
  - People living in cooler places made selection on them which resulted in the development of the present day woolly breeds.
- Goat (*Capra hircus* and *Capra ibex)*
  - Goat was the earliest animal domesticated and the origin of domestication is doubtful because goat and sheep are similar in bone structure. From the available paintings and sculptures of that area, it is confirmed that goats were reared around 7000 – 6000 B.C in Jordan and between 4000 – 3000 B.C in West Asia.
- Swine (*Sus domesticus)*
  - *Sus scrofa* (European), *Sus vittatus* (wild boar) and Malayan pig were domesticated around 2500 – 2400 B.C. They were domesticated latter than cattle and sheep but earlier than horse.
- Horses The present day horses are all traced to one of the three types of horses viz.,
  - Przhevalski's Horse (Steppe Horse) (Central Asia)
  - Desert Horse (Mangolian Horse)
  - Forest Horse
  - According to Ridgeway (1905), the origin of horses were from Przhevalski's Horse (Steppe Horse) (Central Asia), Celtic Pony (Northern Europe) and Libyan Horse (North Africa). Gay (1913) and Matthew (1926) also endorsed Ridgeway's statement.
- Fowl
  - Red Jungle fowl (*Gallus gallus)* was the chief ancestor of the domestic fowl. Evidences from Mohenjo-Daro seals and Egyptian era from 1500 – 1400 B.C confirmed the domestication of poultry.
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HISTORY OF ANIMAL BREEDING

- Till 500 A.D. when the fall of Roman Empire began animal breeding was at its esteem. With the fall of Roman Empire for about 1000 years called Dark and Middle Ages, animal husbandry was at a still.
- From 1700 A.D., again there was an improvement. The beginning of modern animal breeding is to be found mainly in England and Europe.
- The British Royalty encouraged horse breeding especially for race horses. The Earls and Dukes imported bulls from Holland and bred their native stocks. Dutch cattle were introduced into Herefordshire that laid the foundation of the present Hereford cattle. By crossing the native and Dutch cattle and subsequent inbreeding, the British cattle were improved far beyond the best.

LANDMARKS IN ANIMAL BREEDING

- 1677 *Anton Van Leeuwenhock & his student Jonn Hamm;* Observed sperms through a magnifying lens
- 1725 – 1795 Robert Bakewell, an English man began his animal breeding work at Dishley, Leicestershire, England with horses, sheep and cattle. He is called Father of Animal Breeding. He travelled extensively for his time both in England and on the continent in quest of superior breeding stock. He developed theories and tested them with experiments. He concentrated on producing farm animals with increased efficiency. Bakewell's two remarks were "Like begets like" and "Breed the best to the best".
- The reason for Bakewell's success in animal breeding experiments was due to the fact that he followed certain strong principles. They were as follows:
  - Has got definite ideals/objectives/goals. For example, beef cattle – a low set blocky and quick maturity.
  - Practised sire testing by leasing the sires to other breeders and those that proved most satisfactory was brought back for use on his own females.
  - "Breed the best to the best" regardless of relation ship and this led to extremely close breeding.
  - Performed progeny testing of bulls and rams.

    - Introduced inbreeding as tool in livestock improvement.
    - "Like begets like"
- Superior animals are more likely to produce superior offsprings than inferior individuals. He is very critical in his selection of breeding stock not only as to appearance but also as to performance.
- Bakewell's methods were widely copied and thus the foundation of purebred was laid. He laid the foundation for the Shire horses, Leghorn cattle and Leicester sheep.
- 1775 Collings brothers copied the Robert Bakewell's method and laid foundation for the Shorthorn cattle.
- *1780 L. Spallanzani of Italy:* First scientific work on A.I. Successfully obtained three pups by A.I. in dogs.
- 1791 British Royalty encouraged horse breeding for races, which results in English thoroughbred and general studbook.
- Tompkins and Galliers laid the foundation for Hereford breed of cattle in England.
- 1775 – 1849 Thomas Bates developed highly inbred herd of cattle.
- 1822 Coats first published a herd book for Shorthorn breed of cattle. Settlers in America developed American saddle horse.
- 1846 English herd book for Cattle
- 1862 Herd book for Aberdeen Angus Cattle
- 1866 Mendel published the law of heredity in Journal of Zoological Society of Austria
- 1875 Herd book for Dutch Friesian Cattle
- 1879 First work of trap nesting of birds in Austria
- 1890 Babcock's method of fat % estimation (USA)
- 1893 Gerber's method of fat % estimation (Germany)
- 1895 Milk recording Association in Denmark
- *1899 E.I. Ivonoff;* Practised A.I. in many stud farms (horses). First to undertake A.I. successfully in Cattle and Sheep
- 1903 Mendel's principles were rediscovered by DeVeris of Holland, Von Tschermark of Austria and Correns of Germany
- 1907 Growth rate, Feed consumption and Carcass quality for meat production in swine in Denmark
- 1908 G. H. Hardy and Weinberg Independently formulate the Hardy-Weinberg law of population genetics
- 1923 Pig testing station in Sweden
- *1939: Sampath Kumaran of Palace Dairy Farm, Mysore u*sed A.I. for the first time in India.
- *1942 P.Bhattacharya of Indian Veterinary Research Institute, Izatnagar,* first scientific work on A.I. in India.
- 1953 J. D. Watson and F. H. C. Crick Propose the double-helix model for DNA; Discovery of DNA as the genetic material
- 1980 Martin Cline and co-workers created a transgenic mouse
- 1990 The first genetic engineering company "Genetech" founded in San Francisco in USA.
- 1990 Formal launch of the international Human Genome Project
- 1990 Publication of Michel Crichton's novel "Jurassic Park" in which bio- engineered dinosaurs roam in a palentological theme park
- 1997 Researchers at Scotland's Roslin Institute lead by Ian Wilmut have cloned a sheep called "Dolly" from somatic cell of an adult ewe.
- 1998 Scientists from University of Hawai cloned a mouse using Wilmut's technique creating not only dozens of copies but three generations of clones.
- 1998 Scientists at Japan's Kinki University cloned eight identical calves using cells from a single adult cow.
- 1998 Scientists at USA created a cloned calf from a Friesian cow and named as "Jafferson".
- 2000 Cloned dairy calf at University of California at Vermont.
- 2010 Cloned a buffalo calf named 'Shresth' at National Dairy Research Institute, Karnal, India.
- Registry books were set up to safeguard the purity of the breed and to supply authentic record of performance. Livestock shows were also made. From 1880 to 1950, the livestock population has risen in numbers but the number per head compared to human population has declined. But the increase in productivity of dairy cattle, faster maturity and meatier carcasses in meat animals have tended to offset the decrease in number.
- In India, though developments have taken place and many breeds evolved still there is no definite record. Livestock census for the whole India was not available till 1920. The presence of princely states and the absence of uniform policy in taking census and maintaining records, partition of India in 1947 have made these figures only partly reliable. ICAR has started herd books for the first time India for Red Sindhi and

Sahiwal breeds of cattle in 1941. Subsequently herd books were also established for Hariana, Murrah, Gir, Kankrej, Tharparkar, Kangayam and Ongole breeds.

- Superior animals more likely produce superior offspring than inferior individuals. He is very critical in his selection of breeding stock not only as to appearance but also as to performance.
- In spite of the large animal population, India is deficit in all livestock production. This is due to poor genetic worth of our livestock, shortage of fodder, poor economic condition of our farmers and adverse climatic conditions. With determined effort and scientific animal husbandry practices, it should be possible to make the country self sufficient in all livestock products in the not distant future.