

## HISTORY OF DOMESTICATION, DEVELOPMENT AND MAINTENANCE OF BREEDS IN INDIA- A REVIEW

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Article Received on  
21 July 2017,  
Revised on 11 August 2017,  
Accepted on 31 August 2017  
DOI: 10.20959/wjpr201710-9528

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### ABSTRACT

Since time immemorial humans have always used animals for their benefits. In this process they domesticated and a number of wild animals by selecting them for docility, temperament, productivity and several related uses. These animals have always given protection, help, support and supplemented humans with rich source of animal foods like milk, eggs and meat. During early civilization process the prosperity of the individual was determined by the number of domesticated animals he possessed. With time different breeds evolved through selection which was done for extracting some important properties. However in modern times it is very necessary to not only maintain the existing breeds but also to evolve new one with suitable traits so that demands for human needs can be met. These breeds form an inclusive component of the society and should be taken care of.

This review deals with some of the important breeds of cattle and buffalo and the method of record keeping which forms an internal component of their maintenance.

**KEYWORDS:** Breeds, buffalo, cattle, domestication.

### INTRODUCTION

Domestication can be defined as the man's activity of taming the wild animals and to control the breeding, feeding and care (management and health control) of animals. The domestication of animals started over 11000 years ago during which humans tried to domesticate a wide variety of animals.<sup>[1]</sup> The first animals to be domesticated were dogs and

goats about 8500 to 9000 years ago. Domestication of cattle and sheep occurred around 6000 to 6500 years ago. Horse is probably the latest animal to be domesticated by man. Exact lineage and region for the domestication of dogs though unknown, it is unavoidable to think the amount of variation humans had brought in this particular species.<sup>[2]</sup> Since domestication is achieved through change it is imperative that domestication caused many changes in the genetic of the animals different from their wild ancestors.<sup>[3]</sup>

### **History of animal breeding**

The Romans at the time of Varro and Cato (2000 years ago) made comments about the kind of animals to be selected for breeding purpose. Varro advocated the idea of progeny testing. The use of pedigree started in rural England late in the eighteenth century. Robert Bakewell (1726 – 1795) is remembered for setting the pattern for modern animal breeding. He made efforts to produce farm animals (cattle, sheep and horses) with increased efficiency. Robert Bakewell laid the foundation for the Shire horses, Longhorn cattle and Leicester sheep. He appreciated inbreeding as the most effective tool to produce refinement and fixing type. Collings who was one of those who visited and learned from Bakewell laid the foundation of the Short horn breed in 1775. Thomas Bates studied the methods of Collings. He started to keep records of feed consumption in relation to both beef and milk production. He selected with great care and inbred very closely and developed one of the great herds of cattle. Buffon a French naturalist advocated systematic cross breeding.

There soon began group of animals closely relate to each other and similar in type all over England. These were the groups from which came the modern breeds most of which were not formally organised as such until later. The first herd book was “An introduction to the to the general stud book” for thorough breed horses and it started in 1791. The next herd book “Short horn herd book” was published by Coates in 1882. An English Hereford herd book was published in 1846 and a polled herd book for Aberdeen Angus cattle in 1862. Galton (1822, 1911) introduced the quantitative approach to variation among relatives and it could have been made valuable but it was ignored and it had to wait for Fisher, Wright, Haldane and Lush in the period of 1918 to 1939.

### **BREEDS OF CATTLE**

#### **Milch Breeds**

**Sahiwal** – Also known as Lola, Montgomery, Multani. Origin is in Montgomery district in Pakistan. Deep body, loose skin, short legs, stumpy horns, broad head and lethargic gait and

is characterized with massive hump, voluminous dewlap and pendulous sheath in males. They are red, pale red and dark brown in colour. Yield is about 1400 to 2500 kg per lactation (heritability – 0.2 to 0.3). Age at first calving is 37 to 48 months and calving interval 430 to 580 days.

**Red Sindhi** – Also known as Scindhi and Red Karachi. Originated in Karachi and Hyderabad (Sindh) and has characteristic medium sized and compact, well proportioned body, extremely docile. Thick horns with heavy hump, hanging dewlap and sheath are present. Colour is deep dark red colour varying from dun yellow to almost dark brown. Males are darker red than the cow. Yield is approximately 1250 to 1800 kg per lactation (heritability – 0.30 to 0.35). Age at first calving is 39 to 50 months and calving interval of 425 to 540 days.

**Gir** – Also known as Kathiawari, Surti and Decan. Originated in Gir forest of south Kathiawar, Gujrat. Appearance is strikingly impressive, well proportioned body, robust constitution, proud gait and docile temperament. Ears are markedly long, pendulous resembling a tiny curled leaf. Tail is long, whip like with a black switch. Colour varies from red to almost black. Spots of different colours are one of the characteristic of this breed. They give 1200 to 1800 kg milk yield per lactation (heritability – 0.2 to 0.3). Age at first calving is 45 to 54 months with calving interval of 515 to 600 days. The animal has got an excellent reputation as beef animal outside India.

**Tharparkar** – Also known as thari, Grey Sindhi and White Sindhi. Originated in Tharparkar district of Hyderabad, Pakistan. It is a medium size breed, deep built, short, straight and strong limbs. The poll is broad and fore head is wide with moderately developed dewlap. White or light grey line along the spine in young animals is common. Males show virility. Yield is 1800 to 2600 kg (heritability – 0.25 to 0.35). Age at first calving is of 38 to 42 months with calving interval of 430 to 460 days.

### **Dual Purpose Breeds**

**Haryana** – The name indicates its origin in Haryana. Has characteristic proportionate body, compact graceful appearance. Head is carried high. Long and narrow face with short sheath, naval flap is absent. Colour is white or light grey. The breed yields about 1000 kg (heritability – 0.15 to 0.30) with age at first calving recorded at 40 to 60 months and calving interval of 480 to 630 days.

**Ongole** – Also known as Nellore. Originated in famous Ongole tract of Andhra Pradesh. Characteristically are large, heavy and muscular. Hump is well developed and erect. Animals are greatly alert and docile with good gait. The colour of this breed is white but males are dark grey at extremities. Yield is about 1000 kgs of milk per lactation. Age at first calving of this breed is 38 to 45 months with calving interval of 470 days. Ongole has been used for the development of some important beef exotic breeds such as 'American Brahman', and 'Santa Getrudis'.<sup>[4]</sup>

**Kankrej** – Originated in south-east of Rann of Kutch, Gujrat. It is the heaviest of all Indian breeds, has broad chest, fore head dished in the centre, strong curved horns, powerful body and straight back. Hump is well developed. Gait is peculiar to the breed known as is 1 and 1/4 spaces (*swai chal*) with smooth movements of the body and head noticeably high. It is silver grey, iron grey or black. It yields about 1400 kgs (heritability – 0.13). Age at first calving is about 45 to 47 months and calving interval 480 to 510 days.

**Dangi** – Originated in Ahmednagar and Nasik district of Maharashtra. The animals are medium in size with deep bodies. Colour is broken red and white or black and white colour.

**Deoni** – Origin in western Andhra Pradesh. Characteristic of this is an admixture of Gir, Dangi and local animals. Colour is black and white or red and white with irregular patches or spots.

### **Draught Purpose Breeds**

**Amritmahal** – Origin in Karnataka state. Characteristic compact form with short straight back, well arched ribs and powerful sloping quarters. The breed has narrow face and prominent forehead with a furrow in the middle. Long sweeping horns typical of Karnataka type cattle. Well developed dewlap and hump. Grey coloured body with dark neck, head, hump and quarters.

**Kangayam** – Originated in Kangayam division of Coimbatore district of Tamil Nadu. The show true characteristics of Mysore type. The colour of the bulls is grey with dark grey to black markings while the cow is white with black markings in front of the fetlocks on all four legs.

**Malvi** – Originated in Malwa tract of Madhya Pradesh. Characteristic is deep short and compact body. Colour is iron grey.

**Siri** – Origin in hill tracts of Darjeeling, Sikkim and Bhutan. The breed has characteristic massive body with small head, short legs and feet, wide and flat forehead. Well placed hump covered with a tuft of hair at the top. Colour is black and white or red and white.

**Hallikar** – Originated in Karnataka state. It is characterized by medium size, compact and muscular in appearance. Coat colour is grey to dark grey.

**Khillari** – Originated in Sholapur and Satara districts and Satpura range of Maharashtra.

**Bachaur** – Origin in Sitamarhi district of Bihar. Has very close similarity with Haryana breed known for their ability to thrive under poor conditions of feeding. Cows are not good milkers.

Several zebu/Indigenous cattle breeds because of their high tolerance to hot climate and disease resistance have been used in various cross-breeding programmes outside India.<sup>[5,6]</sup> In some South American countries like Brazil a number of these breeds specially Ongole and Gir have exceptional value. But in India a number of these breeds are crossbred with high milk producing exotic cattle breeds because with mechanisation their importance as draught purpose breed has reduced.<sup>[7]</sup>

### **Important Exotic Breeds of Cattle**

**Holstein Friesian** – Originated in two provinces of Netherlands (North Holland and West Friesland). This breed has large size body with black and white colour. The animal possesses large feeding capacity and huge udder. Best milk producer of the world and an average production of 6000 to 7000 kg with low fat % (3 to 3.5%). Age of first calving is of 30 months and calving interval of 13 to 14 months.

**Brown Swiss** – is a native of Switzerland. The breed has fairly large size body with light brown to grey colour. They have large heads which are usually dished. The breed is docile and is more heat tolerant than Jersey. The breed produces about 5000 kg milk per lactation. Age of first calving and calving interval is similar to HF.

**Jersey** – Originated in island of Jersey (English channel). Smaller size cattle with reddish grey to brown colour. Heads have a double dish. Animals are inclined to be nervous and sensitive. The breed is capable of utilising roughages efficiently. On an average produces 4500 kg per lactation with 5.5% fat. Age of first calving and calving interval is similar to HF.

**Ayrshire** – Developed in Ayrshire country of Scotland during 18<sup>th</sup> century by crossing many strains of cattle. It has medium size body which is cherry red to brown in colour.

**Guernsey** – Home tract is Guernsey in the Channel Island. The breed was developed by Brown and White cattle of Brittany and large brindle cattle of Normandy. It has small body with yellowish brown colour.

### **Beef Breeds**

**Hereford** – Developed in Hereford, England. Animals of this breed are red in colour with white face and compact body weighing 600 kg in males.

**Short Horn** – Developed during 18<sup>th</sup> century in Durham Country in England. The breed coat is solid red in colour or red with white markings or white or roan.

**Angus** – Originated in Aberdeen country of Scotland. Angus are completely black body with polled head.

**Santa Gertrudis** – Developed in Texas, USA by crossing Short Horn with Brahmin crossbred bulls. It has 5/8 Short Horn and 3/8 Brahmin inheritance. Animals are deep cherry red colour body.

**Brangus** – Developed in USA by crossing Angus with Brahmin.

**Beef Master** – Developed in USA by crossing Hereford with Brahmin bulls and Short Horn bulls.

### **Cattle breeds evolved in India**

1. **Taylor** – Short horn and Jersey with local cows around Patna.
2. **Jersindh** – Jersey cross Red Sindhi at Allahabad.
3. **Sunandini** – Brown Swiss cross nondescript at Munar, Kerala.
4. **Frieswal** – 3/8 to 5/8 level of exotic inheritance of HF and rest Sahiwal at MDF.
5. **Karan Fries** - HF cross Tharparkar at NDRI, Karnal.
6. **Karan Swiss** – Brown Swiss cross Sahiwal and Red Sindhi at NDRI, Karnal.
7. **Jerthar** – Jersey bulls cross Tharparkar cows at Bangalore.

**Cattle breeds developed in other countries**

1. **Australian Milking Zebu** – 20 to 40% Zebu blood (Sahiwal, Red Sindhi) and rest from Jersey.
2. **Australian Frisian Sahiwal** – at Queensland.
3. **Jamaica Hope** – 80% Jersey, 15% Sahiwal and 5% HF blood, developed in Jamaica.
4. **Charbray** – Brahman cross Charolais.
5. **Mambi** –  $\frac{3}{4}$  HF and  $\frac{1}{4}$  Zebu in Cuba.
6. **Siboney** –  $\frac{5}{8}$  HF and  $\frac{3}{8}$  Zebu in Cuba.

**BREEDS OF BUFFALO**

The buffaloes have a close zoological relationship with cattle; both belong to the same subfamily Bovini of the family bovidae. Two subgenera/groups are Bubalus (Asian buffaloes) and syncernia or syncerus (African buffaloes). Bos (Bubalus) Bubaline –is known as Indian water buffalo. The arni is the ancestor. It was domesticated in India during prehistoric times between 2500–3000 BC. Two types are found one is the river buffaloes and the other type is the swamp buffaloes. It is believed that the Indian water buffalo was domesticated in the western part of the sub-continent and corresponds to the breeding tarcts of Mehsana, Surti and Pandherpuri breeds.<sup>[8]</sup>

**Murrah Group**

**Murrah** – Also known as Delhi buffalo. This breed originated in and around Punjab and Delhi. It is characterized by deep massive frame with short, broad back and comparatively light neck and head. It has short tightly curled horns. Popular colour of this breed is jet black with white markings on tail, face and extremities.<sup>[9]</sup> Skin is soft and has scanty hairs. Body weight of bulls is 550 kg and She-buffaloes weigh around 450 kg. Age of first calving is 42 months and yield is approximately 2000 kg (heritability – 0.2 to 0.3). Calving interval is of 450 to 500 days. Its milk has butter fat content of 7%.

**Nilli Ravi** – Origin in Montgomery and Ferozepur district of Pakistan. The animals are medium in size and deep frame body with an elongated coarse and heavy head. Horns are small with a high coil. The colour is black but brown is not uncommon. Pink markings are sometimes seen on udder and brisket. White markings on the forehead, face, muzzle, legs, switch and around bright eyes are also seen and much liked by breeders.<sup>[10]</sup> Age of first calving is about 4 years with yield upto 1500 to 1850 kgs per lactation is usually recorded. Calving interval of this breed is 500 to 550 days.



**Gujarat Group**

**Surti** – Originated in South Western part of Gujarat state (Anand and Baroda districts).

Characteristics – The breed has got a fairly broad and long head with a convex shape at the top in between the horns. Horns are sickle shaped and flat. Surti breed has got a unique straight back. They are of medium size and docile temperament. The skin colour is black or brown. Age of first calving is approximately 4 years and yield on an average is 900 to 1300 kgs per lactation. Calving interval is of 400 to 500 days. This breed has very high fat percentage in milk (8 to 12%).

**Jaffarabadi** – Origin in Gir district of Gujarat. Has a very prominent forehead and heavy horns which are inclined to droop on each side of the neck and then turn up at the points. The body is longer but not so compact. Dewlap and udder is well developed. Animals are black in colour. Weight of adult bulls is about 600 kg and that of She-buffaloes 460 kg. Age of first calving is 4 years and yields on an average 2300 kgs in a single lactation with calving interval of 15 months. Fat % of the milk is high and ranges from 9 to 10%.

**Mehsana** – Originated in Mehsana, Sabarkanda and Banaskanta districts located in north of Gujrat.<sup>[9]</sup> This breed has been derived from a mixture of Murrah and Surti blood. The breed is medium sized with low set body. The skin colour is mostly jet black and occasionally brown grey with some white markings on the face, legs or tip of the tail. The horn resembles that of the Murrah or Surti breed. The switch of this breed is always black. Age of first calving of these buffaloes is 3 ½ years with a yield of 1800 kgs per lactation. They have a calving interval of 16 months with a lactation length of 350 days.

**Uttar Pradesh Group**

**Bhadawari** – Origin in Bhadawari estate of Agra district. Characteristics of this breed are unique with medium size body that is wedge shaped. They have comparatively small head bulging towards horns. Legs are short and stout and coat colour is copper with scanty hairs. Udder is not so well developed but milk veins are prominent.<sup>[9]</sup> Age of first calving in this breed is of 4 years and yields 1100 to 1250 kgs per lactation with calving interval of 15 months. Has highest fat % among all the breeds with more than 12% fat in milk.

**Tarai** – Originated in Tarai area of U.P.



**Central India Group**

**Nagpuri** – Origin in Nagpur district of Maharashtra. The colour of these animals is usually black. Lighter type than those of north, not so squat and have a short tail. The face and neck is long with heavy brisket. It has long, flat and curved horns which reach towards back over shoulders. Naval flap is short or almost absent. They produce about 1000 kgs milk per lactation.

**Pandhepuri** – Originated in south Maharashtra. Animals of are of medium size with long narrow face and very long, flat and usually twisted horns.<sup>[9]</sup>

**Manda** – Origin along the borders of Orissa and Andhra Pradesh. The general colour is brown or grey with yellowish tufts of hair on the knees and fetlocks and the switch is yellowish - white. The horns are broad and semicircular. Milk yield is satisfactory and males are hardy.

**Sambalpur/Gowdoo** – Origin of this breed is Bilaspur district of M.P. these animals are large and powerful. Females breed regularly and produces satisfactory milk yield. Males are very active and good for draught purpose.

**Kalhandi** – Originated along the eastern hilly region of Andhra Pradesh and adjoining region of Orissa. They are strong animals with broad horns, half curved running backward at the tip. Body colour is between grey and ash grey. Due to its light coloured skin it tolerates heat more than dark coloured buffaloes.

**Jerangi** – Origin in the Jerangi hills of Orissa. One of the dwarf breeds of buffalo and its height does not exceed four feet. Horns are conical and small.

**Toda** – Originated in the Nillgiri hills of Tamil Nadu state. These are large sized animals having long barrel and strong built. Hump and dewlap is absent, chest is broad and deep; legs are short and sturdy. Along the crest of the neck, hump area and back, there is a thick growth of hair like a mane which imparts a bison like appearance. The animals are not always docile. They are gregarious in nature. Females are good milkers yielding from 4.4 to 8.8 litres of very rich milk. Animals of this breed are known to fight predators including tigers. This breed is an endangered breed and represented an earlier divergence time of 1800 to 2700 years.<sup>[11]</sup>

**Some common heritability estimates**

<b>Trait</b>	<b>Estimate</b>
Fat percentage	.55 - .70
Fat yield	.20 - .40
Lactose percentage	.35
Lactose yield	.36
Milk yield(305 days)	.20 - .30
Dairy character	.19
Calving interval	0.0 - .10
Days open	0.0 - .10
Feed efficiency (lactation)	.56
Average daily gain	.3 - .5
Birth weight	.40

In general, reproductive traits usually have low heritability (0.00–0.10), yield (milk, egg and wool) characters have moderate heritability (0.15–0.35) and anatomical measurements usually have moderate to high heritability (0.40 –0.60).

**Recording and handling of data****Record keeping**

The animal farm data is being maintained for the past decades on sheets and registers. More recently, the use of PC has come on the scene for maintaining the data. The enables faster analysis and quick results for monitoring the various farm activities etc. however, in spite of excellent potential of maintaining data on PC, there is still importance and existence of recording the data on registers. The data maintaining in either way has many reasons as the records are useful to the farm manager.

**Purpose of record keeping**

- To know the pedigree and history of each animal pertaining to the production, reproduction and health performance.
- To know the proper growth of young stock by weighing the animal at proper interval and recording the body weight. This will help in the culling of animals with poor growth and late maturity.
- To avoid duplication in allotment of numbers of young stock.
- To calculate the input/output relationship.
- To know the financial status of farm.
- To know the health status of farm.

### Data correction

The phenotypic value for milk, meat, egg, wool and reproducing ability is the joint product of genotype of the animal and the environment received by it during the course of development and expression of any character. The environment factor can be grouped as under:

1. Random environment which includes sampling error and the error in data recording etc.
2. Environmental factors which may be year and season when production starts feeding level and standards, health status, heat/cold stress, management level etc.
3. Physiological status viz. service period, dry period, lactation length, age and body condition etc.

### Purpose of data correction

The above environmental factors influence greatly the ability to produce and reproduce and therefore mask the true breeding value of animal. It is thus proper and logical to remove the effect of any environmental sources of variation and after eliminating or minimizing the effect of environmental factors, the data should be subjected to genetic analysis so as to obtain the accurate estimate of the genetic parameters. This is called as the correction or adjustment of data for environment factors. Therefore, the purpose of adjustment of data is to minimize the environmental variation. The reduction in environmental variance increases the heritability and thereby the accuracy and response to selection is increased.

### Methods of data correction

The different methods which can be used to adjust the data are:

1) **Least squares method:** the most important and commonly used method to adjust/correct the data is the least square constant method given by Gacula.<sup>[12]</sup> This method adjust the data for several factors at the same time by the additive process viz. herd, year, season, age etc. The least square constants of different level of each effect are estimated by the method of least square technique of ANOVA.<sup>[13]</sup> To remove the environmental effects from the data, the correction factor for each source of variation irrespective of their significance are used. The correction factors (L.S. constants) are added to the original record of each individual with sign changed and the resultant quantity is the adjusted record as:

$$y = y_i - CF$$

where,  $y$  = adjusted record

$y_i$  = unadjusted record

CF sum of all correction factors (L.s. constants)

2) **The ratio method** (gross comparison method) which uses the simple average of all animals of each level taken as a ratio of the base level. The resulting factor is used for adjusting the record of animal in that level.

Mathematically, the corrected record ( $y_i$ ) is:

$$Y_i = x_i / R_i$$

Where,  $x_i$  is the unadjusted record

$R_i$  is the conversion ratio taken as  $x_b / x_i$

$i$  is the level of record to be adjusted

$b$  is the basal record

$x_b$  is the average of base record

$x_i$  is the average of record in  $i$ th level

3) **Difference method:** It is used when the level of any effect is only two like sex effect. The mean value of either sex is adjusted to that of the other sex by adding the average of the difference between two sexes.

4) **The regression method:** It is used in two ways viz. simple regression and partial regression.

a) The **simple regression** is fitted when only one factor for which the adjustment is made viz. milk yield is adjusted for 300 days lactation length as:

$$\hat{y} = \bar{y} \pm b(x_i - \bar{X})$$

$\hat{y}$  is the adjusted milk yield

$\bar{y}$  is the average milk yield

$x_i$  is days in lactation

$\bar{x}$  is the average lactation length

$$b = \frac{\sum xy}{\sum x^2}$$

$x$  = days in milk

$y$  = milk yield

b) The **partial regression** coefficients are estimated and used when data is to be adjusted for two or more factors like age, season, year etc. a partial regression coefficient describes the effect of one independent variable on the dependent variable keeping the constant effect of all other independent variables. The prediction equation is an under:

$$Y = b_{y_1.2}(x_1 - \bar{x}_1) + b_{y_2.1}(x_2 - \bar{x}_2)$$

Where,  $y$  = milk yield

$x_1$  = age

$x_2$  = lactation length

### STANDARDIZATION OF RECORDS

The records on some animals are excluded before statistical analysis of data to study the effects of various environmental factors like year/period, season and parity of lactation etc. as well as before subjecting the data to genetic analysis for estimating genetic parameters. Such records are on the following animals:

- The incomplete records due to death or culling of the cows/buffaloes during lactation.
- The records on animals which dried up before 100 days of lactation, depending on the nature of the traits under study viz. such records are excluded for 305 days/lactation milk yield, life time milk production, lactation length and dry period whereas included for birth weight, gestation period, service period.
- The milk records following abnormal calving. The effects of abnormal calvings on various production and reproduction traits are studied separately.

### CONCLUSION

Domestication along with selective breeding for performance trait which also involved adaptation for local climatic condition led to the development various kinds of domesticated animals and several breeds with different species. However the history and the culture associated with domestication can only be utilised if proper care and effective standardization and management of data can be applied for breeding strategies for their maintenance.

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