INTRODUCTION TO ANIMAL BREEDING

THEORY NOTES

FOR

VETERINARY LIVESTOCK DEVELOPMENT DIPLOMA (1st year)

M.R.
COLLEGE OF VETERINARY SCIENCES
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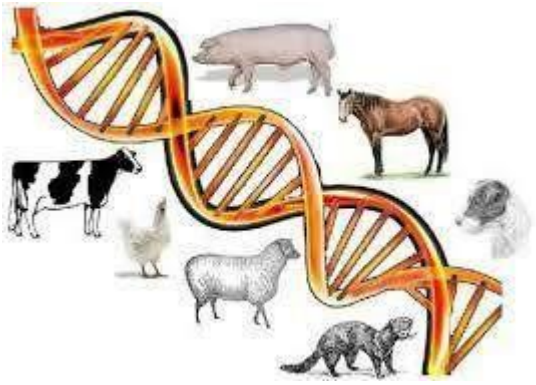

M. R. COLLEGE OF VETERINARY SCIENCES

(Affiliated to LUVAS, Hisar) Hassanpur, Jhajjar

Helpline: 9991822929, 9050922929, 9050022929

Website: mrveterinarycollege.edu.in E-mail: mrcvsjhajjar@gmail.com

INTRODUCTION TO ANIMAL BREEDING

Some general terms of Animal Breeding

1. **Breed:-**A group of similar animals which may have same size, same appearance and same characters is called breed.
2. **Breeding value:**- It is the assessment of the future genetic potential of an animal.
3. **Assortive mating:**- It is a mating /crossing between two animals that look alike.
4. **Correlation:**- It is a statistical term used to describe the relationship and association between characters of an animal. It is measured in correlation coefficient. i.e. Milk characters and fat percentage these two characters have a negative correlation. Lactation length and total milk yield have a positive correlation.
5. **Culling:**- It is removal of animal with poor performance from a population. It is a byproduct of any selection method.
6. **Docking:**- It is removal of animal's tail part.
7. **F_1 generation:-**It is first filial generation or first cross between two established breeds.
8. **Frequency:**- It is also a statistical term to describe the number of times an observation occurs in a population.
9. **Phenotype:**- It is the outward expression of the genetic makeup of an animal.
10. **Germplasm:**- It is genetic material in an animal or in a population.
11. **Inbreeding depression:**- The lowered level of performance that is arrived through increase in inbreeding.

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12. **Inbreeding coefficient:**- The rate at which Heterozygosity is reduced (Homozygosity is increased) for a generation in a population.
13. **Lethal gene:**- It is a gene which causes death after expression in a population.
14. **Plateau:**- It is the level raised after a period of selections when no further progress is possible.
15. **Pleiotropy:-**When one gene has a simultaneous effect on more than one trait.
16. **Allele:-** It is one of the two or more alternative forms of gene. Alleles are those genes which appear at the same locus in homologous chromosome.
17. **Autosomes:-** The chromosomes present in the same number in both sexes of any species.
18. **Chromates:-** The part of the chromosome after it has split down its length in the cell division.
19. **Chromosome:-** Dark staining rod like or rounded bodies visible under the microscope in the nucleus of the cell during metaphase stage of cell division. These are compact bundle of DNA molecules portion of which represents gene. Chromosomes are made up of protein and nucleic acid.
20. **Deletion:-** Loss of a portion of chromosome following breakage of DNA.
21. **Dihybrid Cross:-** A cross involving two pairs of alleles, each of which regulates different characteristics.
22. **Diploid:-** Containing a double set of chromosome. This is the normal chromosome complement for all somatic cells of most animals .
23. **Dominant:-** Condition where one allele masks the effect of the other allele for the same trait. A gene is said to be dominant when its

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characteristics effect is expressed in the heterozygote as well as homozygote. Aa and AA genotypes are indistinguishable.

24. **Epistosis:-**Modification of normal gene expression in which a particular gene at one locus, masks the expression of at least one other gene at a different chromosomal location.
25. **Gene:-**A portion of DNA molecule through which inheritable characteristics is transmitted to succeeding generation in all living organisms. They provide information for the synthesis of various enzymes,each and every type of proteins component of the body. Genes are the basic units of inheritance.
26. **Genetics: -**Branch of biology concerned with the physical bases of transmission of inheritable characters, about the heredity and variation of organisms.
27. **Genotype:-** The genetic makeup of an animal.
28. **Hereditary:-** Transmission of qualities of parents to offspring which consequently are similar or identical to the parents.
29. **Heritability:-** The strength of inheritance of the trait. It is denoted by h square. A technical term used to describe what fraction of the differences in a trait is due to differences in genetic value rather than in environmental factors.
30. **Heterosis:-** The increased level of performance as compare to the average of the parental type is known as heterosis or hybrid vigor.
31. **Heterozygous:-** A term applied to organisms that pass to different allele for a trait. Often one allele (A) is dominant, masking the presence of the other (a),the recessive.
32. **Homologous:-** members of a chromosomes pair which have similar shape and the same sequence of genes along their length.

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33. **Homologous chromosomes:-** From the Greek homo means like and logus means proportion. Homologous refers to chromosomes that are structural a like. Two chromosomes, one is heritable from the sire and other from dam which pairs and synapse at meiosis, have the same morphology and contain genes governing the same characteristics.
34. **Hybrid:-** A heterozygote or a progeny of genetically un like parents.
35. **Law of independent assortment:-** Alleles on non-homologous chromosome segregate independently of another.
36. **Law of segregation:-** during gamete formation pairs of alleles separate so that each sperm or egg cell has one gene for a trait.
37. **Linkage –** The tendency of gene of the same chromosome to stay together rather than to assort independently. Gene that resides on the same chromosome constitutes a linkage group.
38. **Multiple allele:-** Three or more possible allele at the same locus on one pair of homologous chromosome for a given trait such as A, B, O blood group in human.
39. **Mutagens:-** Chemical or physical agents that induce genetic change.
40. **Mutation:-**A random heritable change in DNA that introduce new alleles into the gene pool. Gene mutation occurs in a gene substituting one nucleotide for another result in point mutation.
41. **Recessive:-** An allele whose expression is masked by the dominant allele for the same trait.
42. **X-chromosome:-**A sex chromosome that usually occurs paired in each female cell and single in each male cell in species in which the male typically has two unlike sex chromosomes
43. **Y-chromosome:-**A sex chromosome that is characteristic of male cells in species in which the male typically has two unlike sex chromosomes

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44. **Zygote:-** A fertilized egg before first cleavage. The diploid cell results from the union of a sperm and egg.
45. **Albino:**-Animal with no skin or eye pigments.
46. **Albinism:**-Allele that produces albinos.
47. **Artificial Insemination (A.I.):-**Technique of collecting semen from a male and inserting it into the reproductive tract of the female.
48. **Blood lines:**-General term used to describe relationship.
49. **Germplasm:** - the genetic material in an organism or a population.
50. **Cleft palate:**-Defect where the palate is divided causing young animals difficulty in sucking.
51. **Broiler:-** Bird breed for meat production.
52. **Layer**: - bird breed for egg production.
53. **Castration**:- Removal of the gonad's i.e. Testicles &Ovaries.
54. **Colostrum**:- the first milk produce by dam (mother) after calving.
55. **Nicking**:- Term used to describe a successful cross.
56. **Objective trait**:- A trait that can be measured or can be defined.
57. **Subjective trait**: -A trait that cannot be measured or defined.
58. **Population**: - Group of individual animals.
59. **Puberty** :- Sexual maturity or age at first heat
60. **Teaser**:- vasectomized male that acts as a normal male but cannot pass vital sperm.
61. **Random mating**:- when each male has equal chances of mating with each female.
62. **Reciprocal cross** :- A cross , with phenotype of each sex reversed as compared with original cross , to test the role of parental sex on inheritance pattern
63. **Selection differential: -** the difference between the mean of selected parent and the mean of the population from which they come.

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64. **Siblings**: - Offspring of the same parents, but not necessary born at same time. Full sibs have both parents same & half sib have one common parent.
65. **Standard deviation**:-A statically term that describe the variation of a trait around a mean value.
66. **Sex limited traits**:- Traits that are limited to the sex of animal, they can only be expressed in one sex.
67. **Sexual Puberty:-** Sexual maturity or age at first heat.
68. **AFC:**- Period from birth to the date of first calving.
69. **Service Period :**-Period from date of calving to date of conception
70. **Gestation Period :**-Period from conception(D.O. Successful service) to the date of calving.
71. **Calving Interval :**-Interval between 2 calving.
72. **Lactation length :**-Period from date of calving to the date of drying.
73. **Dry period :**-Period from date of drying to the date of next calving.
74. **Lactation length :**-Period from date of calving to the date of drying.
75. **Lactation Milk Yield ;**-Total milk produced from date of calving to the date of drying.
76. **Average** Milk Yield/day:-Average of lactation milk yield to the lactation length.
77. **Average Milk Yield of Calving Interval :**-Average of lactation milk yield of the calving interval.
78. **Peak yield :**-Maximum amount of milk produced on any day in a lactation.
79. **Life Time Milk Production :**-Total quantity of milk produced by an animal from first calving till death.
80. **Life Span/Longevity :**- Period of birth till death of an animal.
81. **Mortality Rate:**-Death rate of animals in a herd.
82. **Herd Life :-**Difference in dates of birth to the date of disposal(death & culling).

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83. **Herd Average :-**It is the average of milk calculated by including all the breedable animals(Milch& Dry animals).
84. **Wet Average :-**It is the average of milk calculated by only milch animals.

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Selection:-

Moto of selection is keeping the best and cull the poorest.

Selection is a process of giving preference to a certain individual animal in a population to reproduce and where others are denied the opportunity to produce next generation. It means through selection favorable genetic material is multiplied by and distributed in the population so that superiority of the animal is not lost even after the death of animal.

❖ **Basis of selection:-**

1. **Individual selection/performance testing:-**When breeding value of an animal is estimated on the basis of its phenotypic value of trait of that animal and to select it for future breeding. Thiscriterionis called individual selection. This individual selection is done when the animal's own performance is considered as measure of its genetic merit and the individuals are selected only in accordance with their phenotypic value. This is also known as mass selection.

   Breeding value of an individual is estimated from the phenotypic value of that individual as a deviation from population mean (selection difference) times the heritability of that trait. It is also known as probable breeding value (P.B.V.).

$$P.B.V. = \bar{P} + h^2 (P_i - \bar{P})$$

Where

$\bar{P}$ = population mean

$P_i - \bar{P}$ = selection difference

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P_i = phenotypic value of individual animal

h^2 = Heritability ($0 > h^2 \leq 1$)

 # Fraction of heritability:-Heritability is the superiority of parents which is on an average transmitted to their offspring.

H^2 is low in reproductive traits where it is moderate in case of productive traits and it is very high in case of anatomical measurements.

Probable breeding value so estimated is the genetic superiority or inferiority of the individual in comparison to the population means.

- Selection differential:- The difference between the mean of the selected parent and the mean of the population from which they came.

Advantages of individual selection:-

1. Information of the individual to be selected are easily available, thus it is very easy to use this method.
2. It can be applied earlier to progeny testing. It means this method can be applied when pedigree information is not available.
3. Generation interval is shorter in this method as compare to progeny testing.
4. This method gives a direct estimate to its breeding value which is not based to its relative or progeny, so it is a more accurate method.
5. This selection process allows a greater selection differential because the breeding value of all the individuals in a population

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can be estimated while in case of progeny testing only a few individuals may be progeny tested as a parent.

6. This method minimizes the environmental effect because animals for selection are tested in same environmental condition.
7. It is the simplest method to use the selection.

Disadvantages of individual method:-

Under the following condition individual selection cannot be applied:-

1. When the characters or traits are not expressed by individual these are known as sex linked traits.
2. When the traits are expressed later in life or after the death of the animal. i.e. Life span/longevity, age at first calving.
3. When the traits have low heritability.

Keeping in view advantage and disadvantage of individual selection it can be concluded that individual selection is particularly for male animals and is not applied for dairy animals (female) because the most important dairy characters are sex linked expressed in female only and have low heritability. So, individual selection is applied when traits are expressed in one animal and the heritability of trait is very high.

2. **Pedigree selection:-** It is a list or record of ancestors in the past few generation of the individual. These ancestors can be parents, grandparents or great grandparents. The pedigree having high information on the economic character of the ancestors is useful in the selection of an individual. The breeding value of an individual is selected on the basis of performance of its ancestors. So. The selection criteria based

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on ancestral performance is called pedigree selection. There are some practical difficulties to use this pedigree selection such as:-

i. Ancestral records are always not available.
ii. Records may be faulty due to stray mating.
iii. Pedigree records are destroyed with the passage of time.
iv. Most of the dairy characters have low heritability.

Advantage of pedigree selection:-

1. It is less costly as only completion of record of pedigree is required.
2. It allows selection at very younger age and provide 1st hand information.
3. It is also helpful in multistage selection.
4. It is useful for sex limited traits and trait expressed in later life or after the death of animals.
5. It is helpful when two individuals have similar performance but the selection is done for the one who belongs to better pedigree.

Disadvantage of pedigree selection:-

1. While using pedigree selection all the animals of similar pedigree are culled out inspite of the fact that an individual animal may be of good merit and free from recessive allele causing defect.
2. Some pedigree gets undue emphasis and favor irrespective of true merit of the individual and better environment is provided to the progeny of favored pedigree.
3. It introduces non-random biasness because pedigree records are for different environmental condition.

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4. Pedigree selection provides no basis of selection among individual which are descendent of same ancestor.

3. Collateral selection/family selection:- selection criteria to establish the breeding value of an individual may be the information of its collateral relatives. An individual collateral relative which are not related with the individual on direct gene donor recipient basis but receive the common gene from their common ancestors like full sibs, half sibs, cousins, nephew/niece, uncle, aunt etc.

Among collateral relatives which are more closely related to the individual are full sibs and half sibs. The more closely related collaterals can be grouped as full sib family and half sib family. The family means of this collateral relative than form the basis to select the superior individual. The procedure to estimate the breeding value of an individual on the basis of family means is called family selection or sib selection.

(a) Sibs selection:- It is an selection of individual based on its sibs performance. These sibs may be full sibs or maternal half sibs and paternal half sibs. In this way sib selection has two type i.e. full sib selection and half sib selection.

Thus sib selection is practiced for the following traits:-

i. Slaughter trait:- These are estimated after the death. E.g. life span.
ii. Sex limited traits.
iii. Low heritability traits.

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Full sib selection is more accurate than half sib selection but however half sib selection is favored from following reason:-

i. Half sibs are more easily available in the population.
ii. The rate of inbreeding is more in case of more related to full sibs then half sibs.
iii. Increase level of co-relation in full sib selection reduced to accuracy of selection.

(b) Family selection:- Selection criteria are known as family selection if we based on sibs performance plus own performance. The family selection like the sibs selection is two types i.e. full sib family selection and half sib family selection.

Advantages of family selection:-

i. Family selection can improve the character of low heritability in species like pig and poultry where reproduction rate is very high. 9so has to get many sibs in a shorter time)
ii. It does not allow the generation interval to increase.
iii. It is support to individual selection because it is better to select an individual from a superior family.

Disadvantages:-

i. It is costly method of selection particularly when the breeding space and testing facilities are limited.
ii. The limited facilities reduce the intensity of selection. The family selection as a unit of selection results in inbreeding and thus limits the genetic diversity. This is

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because only few family represent the next generation.

iii. The full sib family selection can only be applied in species with high reproductive rate to get large family size.

Progeny testing:- Actually it is a two stage selection:-

i. When we select some of the good animals as parents.

ii. When the progeny is born and put to test and on the basis of progeny performance some are selected and others are rejected on the basis of poor performance of progeny. In other words we can say that in this basis of selection of parents are chosen on their progeny performance. Ultimate product of progeny testing is or will be proven sire.

The selection criteria for evaluating an individual based on his progeny performance is known as progeny testing. The selection criteria are the mean phenotypic value of individual progeny and progeny performance is compared to the mean phenotypic value of their contemporaries.

Requirement of the progeny testing:-

i. It always better to choose more number of sires for every number of sires required for testing. So as to have more opportunity of selection among the progeny tested male. Practically for every number of tested bulls we chose 4-5 sires during initial sires.

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ii. Facility must be there for semen processing and to record information of the progeny.
iii. Progeny should be tested in several herds and comparison should be made in contemporary from their sire. This will increase the intensity of sire testing.
iv. Progeny should be culled out only after testing of progeny.
v. Progeny testing should be completed as early as possible in the life of the male.

Precautions in progeny Testing:-

1. All the females should be allotted randomly to all the sire/male under test to avoid the effect of production level of dam of the family.
2. Different sire group should be raised and compared under similar environmental condition. Progeny so produce should be in the same season and year and recording should be recorded at the same age/lactation.
3. All the progeny should be included or excluded which could not complete the lactation due to their death or culling during lactation or due to diseases or abnormal calving.
4. Data recorded should be corrected for environmental affect like age, ear, season and lactation length etc.
5. More number of progeny per sire should be recorded to cancel out the randomly distributed source of error.

Advantages:-

1. It is a better method for sex limited traits and traits which have low heritability and slaughter traits in meat animal.

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2. It is highly accurate method of selection but when large progeny is obtained.
3. Progeny testing is useful to prove a sire whether he is free from any recessive gene. However to identify the carrier animal for harmful gene it is mated to its sibs or progeny.
4. Main feature is its increase the selection intensity. This is because the progeny will also act as a parent and await selection at the time of testing their own parents.
5. It accuracy increase with increase in progeny number.

Disadvantages:

1. Time and cost required is main limitation.
2. Due to generation interval the genetic gain per year is low.
3. It is effective on adequate number of progeny.
4. This is long time gap between testing and evaluation so the whole environment as well as infrastructure changes with time.
5. Practically only a few sire can be tested causing low selection intensity.

Methods of selection:-

Multi trait Selection: -Overall economic merits of an animal many traits contribute not just one. so while applying selection all these trait are required to be considered simultaneously for improving aggregate breeding value of an animal which is known multiple trait selection. Practically breeding merit of an animal is often determined on several

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traits at one time and not by a single trait. Economic value of an animal depends upon several characters generally known as overall performance or total breeding value of an animal. Suppose we want to select a dairy animal and wants to be more economical then that animal should produce more milk yield, milk with high fat percentage, lactation length should also be higher, cow should have a minimum dry period, cow should have a successful calving on the other hand if a cow or a buffalo yield more milk but with less fat % and short lactation length and goes dry early, also calving is abnormal. So a breeder formerly described a cow will be economical on the basis of overall performance or total breeding value of that animal. Likewise in pig husbandry more profit depends up on better growth rate, better fertility, good mothering ability, efficiency of feed conversion and quality of meat where as in poultry economics comes from annual egg production and egg quality (size, weight, shape)and at which age production starts including the feed conversion efficiency. Trait of direct economic importance in case of sheep is wool (fleece wt., quality of wool, fertility, Lamb wt. and meat quality)in summery total it is essential to estimate the total breeding worth of an animal breed on several related character which is characterized feature of multiple trait selection.

Requirement and efficiency of multiple trait selection:-

1. Economic value of trait is measured as amount by which each unit of variation in it actually increases or decreases. The overall merit of individual is also known as economic trait.
2. Genetic significance of the merit in terms of heritability and genetic correlation among the trait are different.

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3. Method of selection chosen and number of traits included influence the efficiency of multiple trait selection besides economic and genetic significance of the trait.

Multi stage Selection: -When the traits are expressed at the different age of animal and selection is feasible at different stage by commercial breeder more specifically in poultry.

Methods of selection:-

1. **Tandem method:-**In this method of selection individual trait rarely improved successively. The selection is practiced for one trait only at one time till the improvement is attainedsatisfactorily. After improvement in one trait upto a desired level, selection is started for improvement in second trait or another trait till the final goal is achieved upto the desired level.

   Advantages:- Desired level of improvement is concentrated by breeder effectively.

   Disadvantages:-

   i. It is less efficient method of selection because genetic progress per unit time by this method is very low.
   ii. It requires more time for improvement in all the traits because when selection is practiced for one trait other trait will have to wait.
   iii. General improvement of the herd is also slow as there are many traits of breeder's interest.
   iv. Efficiency of this method depends upon the genetic correlation. Among the trait under the selection, a desirable genetic correlation will lead to improvement in other trait

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also. The low genetic correlation will decrease the efficiency of this method because there will be little correlated response in other trait so one can say it is a least efficient method of selection and only practicable for research and lab works.

2. **Independent culling level:-**This method involves two or more trait at a time and for each trait minimum standard level is fixed. Every animal to be selected must fulfill the minimum standard of each trait and when an animal does not fulfill the minimum standard level of trait that get rejection irrespective of the fact that animal is giving good performance in other trait. E.g. minimum level of a Tharparkar cow are follow:-

   A.F.C. = 40 months

   1st lactation yield = 2000 ltre

   Fat percentage = 8%

   But during selection at location A Tharparkar cow is noticed with following data:-

   A.F.C. =38 months

   1st lactation milk yield = 2000 ltre

   Fat percentage = 8.1 %

   Then another cow at location B was noticed with following data:-

   A.F.C.= 42 months

   Fat = 7%

   1st lactation milk yield = 2100 liter

   So animal at location A will be selected and animal at location B is rejected.

Advantages of ICL:-

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i. In this method selection is practiced for more than one trait at one time. So in this way this method is superior from the tandem method of selection.
ii. Culling is possible at early stage. So this is practical and economical advantage of this method is that it allows the culling of the animal at the early age which is inferior in early trait.

Disadvantages:-

i. No combination for better trait.
ii. It does not permit superiority in some trait to compensate deficiency in other trait and likewise there is a great possibility of culling the genetic superior animal.
iii. This method involves a tandem level to determine optimal culling.
iv. In case of ICL early expressed trait are given more emphasis rather than actually more important traits which will be expressed later in life.
v. Selection intensity is reduced with increase in number of traits.

3. **Total score method (selection index method):-** In this method of selection, selection is practiced for several traits simultaneously by giving appropriate weightage to each trait. However this method differ from ICL in following ways:-
   i. Culling level is flexible in this method whereas culling level is very rigid in ICL method.
   ii. In this method each trait is given weightage by a score and these score for individual trait are summed upto reached a final score for each animal and these total score are taken as

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criteria for selection from any of population. This is not in the case of ICL.

iii. Superiority in one trait can make up the deficiency in another trait unlike the ICL where deficiency in one trait leads to rejection of the animal.

Efficiency of selection index method over other method of selection:-

i. This method of selection allows the animals which are superior in some traits to be selected regardless of their inferiority in other traits. So superior genotype is selected and saved.

ii. All traits do not have equal heritability so the same intensity of the selection will not be expected to give same proportionate for each trait.

iii. These traits are correlated to each other to which this selection index method gives due consideration. It also results in more genetic gain for a giving time.

Selection of a male or bull: -The male as well as female contributed equally for the express of objective and subjective trait. Equal importance should be given for the selection of bull. Emphasis is given more the selection of a male or bull because:-

i. Dam leaves a limited number of progeny in its life time where sire leaves much more numbers of progeny in its life time.

ii. Only a few Sires are needed for breeding a large herd. Hence selection can be made of higher intensity thereby making the selection differential.

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On the basis of above explanation it is rightly said that bull is “half the herd”.

Criteria of selection of bull:- Before selecting the bull selector should be clear in mind about the purpose of bull weather the bull is used for natural selection or it will used by semen collection.

1. Bull should be true to breed.
2. Bull should be free from any systematic or any contagious diseases.
   Testis should be normal and match with age of animal, also free from all diseases:-
   i. Cryptorchidism: - It is a condition in which Testis fail to descend from abdomen to scrotum. Orchidopexy– surgical method to descend the testis to its normal position.
   ii. Endrological examination:- Male there should not be of bifid scrotum. Normally septum in scrotum is marked externally. Bifid scrotum should not be selected in breeding.
3. Hind limb of bull should be thick and strong.
4. Walking style is stiffness in gait.
5. Eyes should be shining, bright and active.
6. Age of the bull should not more than three years.

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DATA RECORDING

Recording of breeding data:-

Any type of record can be maintained in following steps/ways:-

i. Books form.
ii. Loose leaf system or file system.
iii. Envelopes system.
iv. Digital system.

❖ **Importance of record keeping:-**

[A] To know the pedigree and history of every animal regarding its production, reproduction and health.

I. It helps to compare between herd performances within the breed and make breed comparison also.
II. Breeding valve for different economic trait can be estimated which help in selection and culling of the animal which in turn brings the genetic improvement in the herd.
III. On the basis of production, close management and appropriate feeding can be provided.
IV. It also helps in fixing the price of animal.
V. Animal with optimum level of production can be registered in different government schemes. i.e. Central government herd registration scheme.
VI. Based on the production feeding requirement of the herd can be estimated.
VII. Record keeping also helps in research and development planning.

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[B] Record keeping also helps to know proper growth of young stock by weighing the animal. By this method/way culling of animal can be adopted at young stage.

I. To avoid duplicity in allotment of identification number.
II. To know the financial status of the farm by keeping the sale register, death register/book and cash book etc.
III. To know the health status of the herd by keeping record of daily treatment register.

Types of records:-

1. **Birth register:-** Birth register should contain date of birth, birth weight of calf, calf number (Ear tag number, tattoo number), Sex of calf. Practice of dehorning may also be indicated.
2. **Growth register:**- This register contains information regarding date and weight measurement at different time of intervals.
3. **Daily treatment register/OPD register:**- This register contain date, name of the animal's owner, diseases of the animal and treatment of the animals, detail of lab record may also be mentioned.
4. **Herd strength register:**- Number of animal with their category should be given.
5. **Milk record register:**- It contains information about the amount of milk produced by each animal of the form during morning and evening daily. Specific gravity of milk is 1.028-1.032, so digital weighing is internationally recommended for milk production.
6. **Pedigree-cum-history book (red book):-** This register contains information of each animal regarding its brand number, its breed, dam number, dam's milk yield, sire's dam's milk yield. Date of

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birth or date of purchase, production and reproduction data (lactation number, date of service, sire number, number of services per conception, date of calving, type and sex of calf, milk yield in 305 days, total milk yield of lactation, peak lactation and date of going dry.

7. **Milk feeding register:**- This register contains information regarding amount of milk fed to calves during morning and evening in case of weaned calves.
8. **Feed and fodder register:**- This register contains information regarding receipt and expenditure incurred on feed and fodder fed to every animal on day to day basis. This register also gives information of feeding green fodder and MCR (Mixed concentrate Ration) to every category of animal at the farm.
9. **Disposal register:**- This register has information about sale (milk, other product, animal) and mortality.
10. **Cash book:**- This register has information about cash transaction i.e. receipt and payment.
11. **Breeding register:**- It can be maintained in 2 ways:-
    a) Cow wise:- It is generally referred as A.I. register. This register contains information regarding cow number to be inseminated, date, breed, category of animal, number of A.I., date of last calving, number of straw used, follow up (P/NP and M/F), age at puberty/service period.
    b) Bull wise:- It gives information about how many inseminations done with each bull.

    Combination of both these register is equally important for cross checking of breeding work.

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12. **Stock register:-** It contains all items which are commonly used at the farm.
13. **Ledger register:-**This register contains the record of non-consumable articles.

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TRAITS OF DAIRY ANIMALS

Traits can be categorized into 2 categories:-

1. **Directly observed traits:-** Such traits can be observed directly i.e. without any help. These traits includes:-
   i. Birth weight
   ii. Body weight at different interval of time
   iii. Type of calf born (normal or abnormal)
   iv. Sex of calf
   v. Body color
   vi. Body measurements
   vii. Physiological traits (temp., respiration and pulse rate)
   viii. Absence or presence of body parts
   ix. Incidence of any diseases
   x. Physical defects
   xi. Milk composition
   xii. Blood groups
2. **Generated traits:-** It includes all the traits which are derived or generated by the owner. Most of the economic traits in farm animals are generated from the information available in pedigree sheets. Some of these traits are generated for each individual while others are generated for whole of the herd or whole of the generation. These traits includes:-
   i. Age at sexual maturity:- It is a period between date of birth and date of the first observed heat or estrus.
   ii. Age at first calving:- It is a period between the dates of birth to date of first calving.

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iii. Service period:- it is a period between dates of calving to date of conception.

iv. Gestation period:- It is a period between dates of conception to date of calving.

v. Calving interval:- It is an interval between two successive calving.

vi. Fertility index (bull):- It is a ratio of conception to inseminations.

F.I. = Number of conceptions X 100
Number of insemination

This is the fertility index of any single bull but if estimated for whole of the herd than it is known as conception rate or fertility rate. If it continues further than it is also called pregnancy rate.

vii. Breeding efficiency:- This trait is estimated for the life time of cow or buffalo based on number of calving in its life time. Three formulae for the calculation of breeding efficiency:-

a) Tomar formula for cows:-

B.E. = n X 365 + 1020 X 100
A.F.C. + C.Is.

Where,

n = number of calving intervals = number of calving – 1

A.F.C. = age at first calving in days

C.Is. = calving intervals is the sum of all calving intervals in lifetime in days

b) Tomar formula for buffalos:-

B.E. = n X 365 + 1020X 100

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A.F.C. + C.Is.

c) Willcox formula for all animals:-

B.E. = $\frac{365\ (n-1)}{D} X\ 100$

Where,

n = number of calving

D = number of days from 1st heat/estrus to last calving

viii. Lactation length:- It is a period between dates of calving to date of declared dry.

ix. Dry period:- It is a period between dates of declared dry to date of next calving.

x. Sex ratio:- It is a percentage of male and female birth to the total birth.

Economic traits of livestock/Economic utility characters of livestock:-

These traits are related to economy of farmer or livestock owner. Character are related to money (profit/Loss) are called economic utility character of livestock.

These traits are of two types:-

1. **Subjective traits:-** These traits are not measured in positive term; however these traits are based on scoring, grading and proportion. E.g. Color of skin.
2. **Objective traits:**- Such traits can be measured in positive terms. E.g. Milk yield, body weight.

Economic Traits of cattle and buffalo:-

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1. **Objective traits:-** These traits are further classified into three groups:-
   A. Growth traits:-
      i. Birth weight
      ii. Age and weight at maturity
      iii. Length and height
      iv. Age and weight at first calving.
   B. Production traits:-
      i. Milk yield per lactation
      ii. Fat percentage
      iii. Total fat yield
      iv. S.N.F. percentage
      v. Lifetime milking
   C. Reproduction traits:-
      i. Gestation periods.
2. **Subjective traits:-**
   A. Body confirmation:-
      i. Placement of udders and teats.
      ii. Structural soundness.
   B. Breed characteristics
   C. Body resistance

Economic traits of sheep and goat:-

1. **Objective traits:-**
   A. Meat traits:-
      i. Fertility – number of lambs/kids
      ii. Birth weight
      iii. Weaning weight

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iv. Average daily weight gain
v. Body weight at 6 month and at the age of 1 year.
vi. Dressing percentage

B. Wool traits:-
i. Fiber diameter
ii. Staple length
iii. Fleece weight
iv. Modulation – unit is percentage
v. Crimps – units is number

2. Subjective traits:-

A. Body confirmation:-
i. Structural soundness
ii. Muscles fatness

B. Breed characteristics
C. Body resistance

Economic traits of poultry/Economic utility characters of poultry:-

1. Objective traits for layer:-

A. Number of eggs
B. Weight of the egg
C. Quality of egg/yolk quality
D. Egg shape

2. Objective traits of broiler:-

A. Body weight
B. Carcass weight/dressed weight
C. Ratio of breast meat to total meat.
D. Shank length
E. Feed consumption per unit of dressed weight

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3. **Subjective traits of poultry:-**
   A. Body confirmation.
   B. Breed characteristics
   C. Body resistance
   D. Persistency in egg laying

- **Animal breeding:-** animal breeding is the study of the application of fundamental law of genetics.

System of breeding:- the aim of breeder is to involve outstanding and improve types of animal which can random better service to man. Selection and system of breeding constitute the only tools available to the breeder for improvement of animals. Since new gene cannot be created through, they can recombine into more desirable grouping system of gene have been broadly divided under:-

1. **In breeding:-** it is defined as the mating of more closely related individual than the average of population this is mating of related animal.

Example:- each animal; have two parent four grandparent 8 great grandparent than 1024 in 10^{th} generation. In 20^{th} 1048576.

Classification of Inbreeding:-

I. Close breeding :-This means the mating of full brother and sister or sire to his daughter or dam to her son these type of mating should be used only when both parent are outstanding individual and bringing undesirable recessive gene into homozygous from in the progeny .

- Advantages of close breeding –

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1) Undesirable Recessive gene may be discovered and eliminated by further testing in this line.
2) The progeny are more uniform than out breed progeny.

- Disadvantages:-
  1) It has been observed progeny becomes more suitable disease.
  2) Breeding problem and reproductive failure usually increase.

II. Line Breeding:- This mating of animals of wider decrease of relationship than those selected for close breeding .It promotes uniformity in the character .Homozygosis is not reached so quickly as an close breeding neither desirable not harmful characters are developed so quickly It is a slow method for the fixation of hereditary(heredity) outstanding bull or cow the progeny is mentioned has been breed to certain ancestors.

- Advantages of line breeding:-
  1) Increase uniformity
  2) The dangers involved close breeding can be produced.

- Disadvantages:-

The chief danger in line breeding is that the breeder will select the animal for pedigree giving no consideration to real or individual merit. This may result in some in which a few generations receive no benefits from selection.

2. Out-breeding:-out breeding is the breeding of unrelated animal and this involve the following types of breeding.

i. Out crossing:- it consists in the practice of mating of unrelated pure breed animal with in the same breed. They

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animal mated have no common ancestor on either side of their pedigree up to a mating known as out cross.

ii. Cross breeding:- it is the mating of different breed it is generally used where the crossed progeny is directly marked and not needed for breeding and further multiplication. It has become quite common in pig and in the production of hybrid chicken. It is generally used for production of new breed. A heterozygous individual of the female when cross with a member of the homozygous recessive race .the off spring group themselves into a phenotypic ratio 1:1. If on the other hand the individual of the parent race were to be homozygous dominant all the offspring will be phenotypically alike. A phenotypic ratio of all tall to dwarf 1:1(Tt X TT = TT,TT, Tt, Tt) all being tall there is no ratio of tall to dwarf.

Types of cross breeding:-

(a) Criss crossing

(b) Triple crossing

(c) Back crossing

- Advantages of cross breeding –

a) It is valuable as means of into a breed in which they have not existed formally.

b) It serves a good purpose in evolving a new breed owing to the fact that it disturbs the balance and brings out recombination in the germplasm to cause variations.

c) It is an extremely handy tool to study the behavior of characteristics in hereditary transmission.

d) Cross breed animal usually exhibits with an accelerated growth and vigor or heterosis which means the blending desirable

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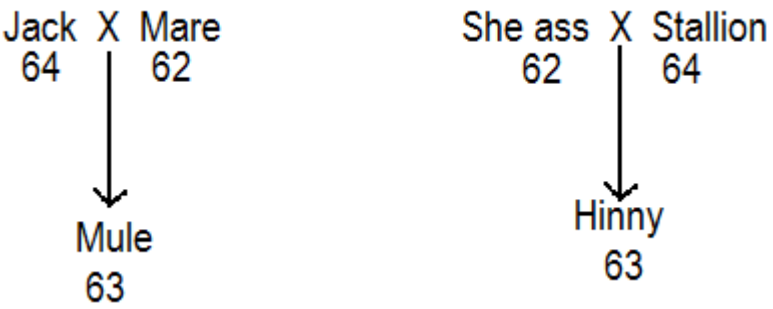
dominant genes from the two breed in the first generation. Such animal grow repeatedly produce more milk,wool and eggs etc.

- Disadvantages of cross –
  a) Breeding merit of cross breed animal may be slightly reduced because of the heterozygous nature of their genetic composition.
  b) Cross breeding requires maintenance of two or more pure breed in order to produce the cross breeding

iii. Grading up:- Grading up is the practice of breeding sire of a given breed to non-descript females and their offspring's for generation after generation. Grading up is a process by which a few pure breed sires can rather quickly transform a non-descript population in to a group of pure breed. The grading process does not create anything new but it may transfer the good quality of an improved breeds.

iv. Species hybridization:- It is defined as mating of individual belonging to different species.eg- Mule and Hinny.



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Mule combines the sum of superior quality of both species. It has size strength, sprite as that of the horse and endurace and ability to thrive in poor feed as that ass. Generally hinny is imperior to mull as a work animal.

- Cattlo:-Cattlo is term refers to various combinations of domestic cattle and American bison. Cattlowas useful as beaf producer and well adoptedto cold as well as tropical areas but commercially success was not achieved.

Heterosis or hybrid vigor:- Heterosis or hybrid vigor is a phenomina in which the crosses of unrelated individuals after result in progeny with increased vigor much above there parents. When 1 breed is crossed with the other 1parents supplies a favorable dominant gene to offset and the reccessive once supplied by the other and vise-versa.

Two theory of heterosis:-

a) Dominance theory of heterosis.
b) Over dominance theory of heterosis.

Breeds of cattle

Zoological classification of cattle:-

Kingdom - Animal

Phylum - chordate

Class - mammalia

Order - artiodactyl

Sub order -ruminatia

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Family - bovidae

Genus - bos

Species - boss indicus ,bostaurus

Term in relation to cattle:-

1. Species is called as bovine.
2. Group of animals is called herd.
3. Adult male is called bull.
4. Adult female is called cow.
5. Young male is called bull calf.
6. Young female is called heifer.
7. New born is called calf.

- **Species:-** A group of individuals which have certain common character that distinguish them from other groups of individuals. Within a species individuals are fertiles when mated in different species they are not

Milch Breeds of cattle: -

- **Sahiwal:-**

*Common name:- Lola, Montgomery, Teli, Multani, Lambhi-bar.

*habitat:- Montgomery dist. in Pakistan, Ferozpur, Amritsar.

*Characters:-

i. Age at first calving is 40 month.
ii. Heavy breed with symmetrical body, known as Lola because of loose skin .
iii. Best Indian breed, average milk 2270kg with fat 4.9% lot.

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iv. Muzzle of Sahiwal is light color.

Red Sindhi:-

*Common name:- Sindhi, Red Karachi

*Habitat:- Sindh in Pakistan specially Karachi and Hyderabad. From position of Sindh called as Kahistan which from the real breed track of this breed.

*Character:-

i. Middle size and shape, compact and symmetrical .
ii. Color – distinct red varies from dim yellow to dark yellow.
iii. Horns are thick at base emerge laterally curve upward
iv. Average milk rate 2150kg with 4.5% fat percentage.
v. Age at first calving is 44 month.

Gir:-

*Common name:- Gujarati, Bhodali, Sorthi, Surathi

*Habitat:-Gir hill and forest in the south of Kathiawar in Gujarat.

*Character:-

i. medium size with well proportionate.
ii. Color – white and red or chocolate brown .
iii. A broad convex massive forehead.
iv. Ears are very large and pendulous.
v. Average milk 2100kg with 4.4% fat.
vi. Age at first calving 45-54 months.

Tharparkar:-

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*Common name:-White Sindhi , Gray Sindhi , Thari.

*Habitat: - South east Sindh in Pakistan, Tharparkar district of Hyderabad, Kutch of Gujarat, Jaisalmer and Jodhpur in Rajasthan.

*Character:-

i. Deep stocky built animal of medium size.
ii. Color - White or grey with darker extremities.
iii. Legs comparatively short and straight.
iv. Average milk yield 1750 kg with fat 4.9%
v. Age at first calving 41 month.
vi. Bullocks are good for ploughing and carting.

Dual Purpose Breed: -

- **Hariana:-**

*Habitat:- District of Rohtak , Hissar, Jind, Gurugram and part of Karnal in Haryana and Delhi.

*Characters-

i. Compact and well proportionate body
ii. Colour is white and light grey

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iii. Long and narrow face with flat forehead and well marked bony prominent at the center of the poll.
iv. Horn are short and horizontal.
v. Sheath is sort and tight and naval flap is absent in bulls.
vi. Average milk yield is 1000kg.
vii. Age at first calving 52 month.

Ongole:-

*Common name:- Nellore.

*Habitat:-Ongoletaluk in Guntur district Andhra Pradesh.

*Characters:-

i. large and heavy breed.
ii. Popular coat color is glossy white.
iii. Prominent for head, horn are short and stumpy.

iv. Hump is well developed and erect.
v. Dewlap is large , fleshy and hanging in folds extending to the naval flap.
vi. Average milk lactation is 700kg with fat 5%.

Kankrej:-

*Common name:-Wadad, Talabda, Nagar, Bonnai.

*Habitat:-South east of Ran of Kutch Gujarat.

*Character:-

i. one of the heaviest Indian cattle breed.
ii. Colour – silver grey, iron grey
iii. In female hump and hind quarters are always darker than the barrel.
iv. Horns curve upward and outward in lyre shape fashion .
v. Gait is particular to breed known as swaichal with smooth movement of body.
vi. Naval flap is prominent in females.
vii. The average milk yield 1750kg
viii. Age at the first calving 48 month

Nimari:-

*Habitat:-Nimari breed largely in Narmada valley, Nimar and Khargon district of Madhya Pradesh.

*Character:-

i. It is mixed from with Gir and Khillari breed.

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ii. It is also known as Khargoni breed.
iii. Nimari breed are efficient both as draught animals and milk producer.
iv. Average milk yield 915kg during lactation period.
v. Bullocks are powerful draught animals and are particularly used for lifting water.

Deoni:-

*Common name:-Dongerpati, Dongari.

Habitat:-Bidar district of Karnataka and Latur district of Maharashtra.

Characters:-

i. Deoni breed resembles Gir breed, less pronounced forehead.
ii. Horns have a characterstics outward and back ward curve.
iii. Deoni breed have lean face, black and white or red or white with irregular patches or spots.
iv. Deep chest, well arched ribs straight back, strong quarters, heavy dewlop and pendulous sheath.
v. No notch near the tip of ear.
vi. Average milk yield is 800-1000kg
vii. Age at first calving 53 months.

Dangi:-

*Common name:-Kalkheri, Sonkheri.

*Habitat:- Small breed belonging to Akola area in Ahmadnagar district, Ghats of Nasik, Thana and Kolaba district of Maharashtra.

*Characters:-

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i. Dangi breed has adaptability to heavy rain Flow.
ii. Head is usually small, slightly protruding forehead, muzzle is large.
iii. Ears are small, legs are short and stout.
iv. Dewlap is slightly pendulous, excellent working qualities in heavy rain.

Mewati:-

*Common name:-Koshi

*Habitat:-Mewati found in Koshi track of Mathura district of Uttar Pradesh and Alwar, Bharatpur district in Rajasthan state. Breeding tract is also includes Gurgaon and Faridabad district of Haryana. In Haryana this breed called Mewati.

*Characters:-

i. Mewati cattle are powerful and docile, useful for heavy ploughing and drawing water from deep wells.
ii. Mewaticattles are usually white with neck, shoulder and quarters of darker shade.
iii. Horns small to medium size and tips of horns are pointed.
iv. Average milk yield is around 958 kg.

Rathi:-

*Common name:-Rath

*Habitat:-Rathi breed is found in north and west of Alwar and in the adjacent territory Rajasthan.

*Characters:-

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i. It is probabily admixture of Nagori, Hariana and Mewati breeds.
ii. Similar appearance in Haryana.
iii. Animals are compact medium size and powerful well adopted from moderately heavy ploughing.
iv. Ears are short but pendulous, well developed for and hind quarters.
v. Short tail with black switch.

Draught Purpose Breed of cattle

Hallikar:-

*Habitat:- This breed is found in Mysore, Madhya Bangalore, Kalar, Tumkur, Hassan and Chitradurga district in Karnataka.

*Characters:-

i. Medium size muscular and compact body.
ii. Grey to dark grey color with deep shading horn, forehead and hind quarters.
iii. Frequently light grey marks on the face, dewlap and under the body.
iv. Prominent forehead and furrowed in the middle.
v. Long face and tapers towards the muzzle.
vi. Horns emerge near each other from the top of the poll.
vii. Ears are tapering to a point.
viii. Dewlap is thin and hump is moderately developed.

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Amritmahal:-

*Habitat: - Hassan, Chikmanglur and Chitradurga district of Karnataka.

*Characters:-

i. Medium size animal with compact tucked in body.
ii. Color of this breed is grey which is varies from white to nearly black.
iii. Head is long and tapering towards the muzzle.
iv. Horns are long emerges from the top of the poll.
v. Legs are strong, long with hard hooves.
vi. Most hardy Indian breed and best draught breed of cattle.


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Khillari:-

*Common name:-Mandeshi, Shikari.

*Habitat:- The breed originated from Sholapur and Satatra district in Maharashtra and VijaypurandDharwad district .

*Characters:-

i. Khillari breed originated from Hallikar, Amritmahal. Animal resemble Amritmahal breed of cattle except Khillari breed look even more bigger framed.
ii. Medium size, Symmetrical, compact long body with strong lips.
iii. Forehead is long narrow with a gradual convex bulge backward to the horn.
iv. Horns are long and pointed and follow the backward curved of the forehead.
v. Bullocks are well known for their quick draught capacity.
vi. Best draught breed of Maharashtra.


Bargur:-

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*Habitat:-Bargur hills at Bhavani, taluk of Erode district in Tamil Nadu.

*Characters:-

i. It is medium size and more compact.
ii. Color of this breed is red with white spots or patches of variable extend in the body.
iii. Horns, eyes, muzzle and hooves are brown in color.
iv. Thin and leafy ears.
v. Horns closer at the roots.
vi. Strong and short legs.
vii. Tucked-up sheath.
viii. Very good for ploughing and carting work with large power.


Nagori:-

*Common name:-Nagori

*Habitat:- Jodhpur and Nagor district of Rajasthan. The breed is supposed to have been evolved from Hariana and Kankrej breed.

*Characters:-

i. Color of this breed generally white or grey.

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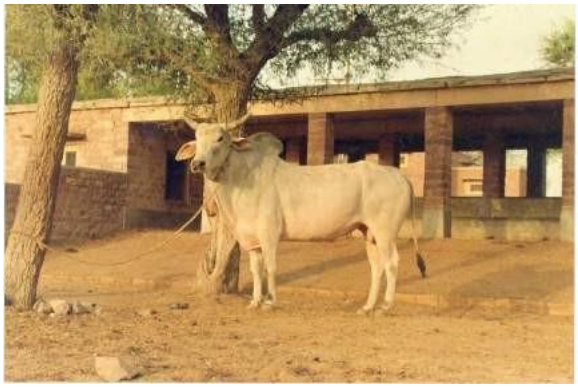
ii. Body of this breed is long, deep, powerful with straight back and well developed flat forehead.
iii. Ears are large pendulous, dewlap is small and fine.
iv. Face is narrow rather longer.
v. Horns moderately developed emerging from outer angles of poll in outward direction.
vi. It is a best draught breed of Rajasthan.




VECHUR :-

***** Common name :-Sitamarhi

*Habitat:-Sitamarhidistt. of north Bihar.

*Character:- i) colour of this breed is grey.

ii) Compact body, straight back well rounded barrel.

iii) Broad, flat forehead and large prominent.

iv) Ears are medium size, compact.

v) Tail is short, well known for its medium draught ability.

vi) Best draught breed of Bihar.

MRCVS MRCVS


Malvi :-

* Common name:-Mahadeopuri, Monthani.

*Habitat :- The breed named from the Malva tract. Name after the family of kings called Malva in MP. At present this breed is mainly found in Rajasthan. There are two types of Malvi breed which are generally recognized as Agar type which found around the Shahjhapurdistt. of MP. andJhalawardistt. ofRajasthan. Mandsauror Bhopal type which is comparatively smaller in size and is found in the distt.of Bhopal and Mandsour.

*Character :- i) Deep, short and compact body.

ii) Ears are alert and short in size but thick horn tapering to blunt point.

iii) Short neck, thin dewlap but straight and strong muscular legs.

iv) Sheath and naval flap are also short.

v) Tail is moderately long with a black switch reaching to fat lock.

vi) Color of this breed is Gray to brown gray and almost black in neck and quarters.

vii) Breed is essential of good draught breed.

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Kankatha:-

*Common name: -Kenwariya.

*Habitat: - Uttar Pradesh

* Characters:- i) Body short, deep and compact straight back.

ii) Short head, sharp pointed ears and tail of medium length with black switch reaching below the hock.

iii) Strong horns are pointed outward.

iv) Bullocks are powerfull.


Kangayam :-

*Common name:-Kanganad, Kongu.

*Habitat: - Erode parts of Koyambatur, Dindigul and karurdistt. OfTamilnadu.

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*Characters:- i) This type of breed are usually grey or white gray with black marking fat locks on all four legs and sometimes on the knee.

ii) Horns are longer curving outward and backward than inward and almost complete a circle at the point where they approach the tips.

iii) Fore head of this breed is broad with a shallow groove at the center.

iv) Dewlap is thin and short.

v) Well developed white thighs, hard and strong hooves.

Kherigarh :-

*Habitat :-Lakhimpur-kheridistt. of Uttar Pradesh.

*Characters :- i) Generally white in colour with small active ears.

ii) This breed has bright eyes, short neck with well developed hump.

iii) Dewlap is thin and pendulous, long tail ended in a white switch.

iv) Bullocks are good for light draught and trotting purpose.

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Siri :-

*Habitat :- The animals are found in hill tracts of Darjeeling, Sikkim and Bhutan.

*Characters:- i) Massive body, small head, square cut, white and flat fore head presenting to convexity.

ii) Sharp horns relatively small ears, well placed hump covered with a tuft of hair at the top.

iii) Strong legs and feet, tight sheath.

iv) colour is black and white or red and white , dewlap is not prominent.


Ponwar:-

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*Habitat:-Pillibhit and Lakhimpur-kheri in utter-pardesh.

*Characters:- i) Tail is long and tapering.

ii) Hump is well developed, horns are long.

iii) Big and Bright eyes, small narrow face, small ears.

iv) Colour of this breed is generally black and white.


Gaolao :-

*Habitat :- Southern MP, Maharashtra.

*Characters:- i) Very long narrow face with flatforehead.

ii) Eyes are almond shape, ears are medium size.

iii) Horns are stumpy and short, voluminous.


CVS MRC CVS

Krishna valley:-

*Habitat:- Home tract of this breed is black cotton soil along the river Krishna and areas of Ghataprabha and Malaprabha in Karnataka.

*Characters :- i) This type of breed is an odd mixture of Gir, Ongole and local maysoor type breed.

ii) Long and massive body, deep and broad chest.

iii) Head is comparatively small with slightly bulging forehead.

iv) Small horns are curved usually emerging outward and slightly curved inward.

New Breed

Karan Fries :-

*Habitat:- This breed has got its origin at the NDRI Karnal, out of crossing between Tharparkar and HF. In many parts of Haryana this breed is no popular.

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*Characters:- i) Colour of this breed is black patches on its body and sometimes patches are completely spreadon the body. Sometimes dark with white patches on the fore head and on the switch.

ii) Udder is also dark with white patches on the teats.

iii) Animals of this breed are extremely docile.

iv) Average age at first calving 30-32 months.

v) Average milk yield is 3700 kg with 3.8-4.0 fat percentages.

Karan Swiss :-

*Habitat:- The breed has been evolved NDRI Karnal in Haryana. By breeding the Sahiwal cow with the frozen semen of brown swiss bulls.

*Characters:- i) Males are strong, sturdy and useful as draft animals.

ii) Colour of the animal varies from light grey to deep brown, sometimes a white spot see on the fore head, fore head is flat to slightly dished.

iii) Ears are small, neck is medium size, Naval flap is light to slightly loose.

iv) Legs are proportionate in size, long humps.

v) Switch of tail reaches to the ground.

Sunandini:-

*Habitat:- The breed originated in Kerala by local non-descript cattle with Jersey, Brown swiss and HF breed followed by selection more than

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2 millionssunandinis now contribute to Kerala milk production, semen of sunandini bulls have exported.

Exotic Breeds

- **Jersey :-**

- Habitat:- Jersey island in the English channel.
- Characters :- i) small and compact body, so it is smallest exotic breed.
  ii) Fawn colour with or without white marking on the body.
  iii) Protruding eye balls with double dished head.
  iv) This breed is most hardly exotic breed.
  v) Avg. milk yield is 4000 kg with 5.5 fat percentage.
  vi) Age at first calving 38 months.
  vii) Jersey breed is choice for upgrading non-descript cows in hill areas.
  viii) Lactose in milk 4.9%.

- **Holstein Friesien :-**

*Habitat:-Originated in two provinces of Netherlands (NorthHoland and west Friesland).

*Characters:- i) Large size so it is called as heaviest exotic breed of cattle.

ii) Coat colour is black and white.

iii) Head is long and narrow and straight with slightly rounded shoulder.

iv) Average milk yield is 6000-7000kg with 3.5 fat percentages.

v) Age of first calving is 36 months.

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vi) Low heat tolerant, require quality feed and fodder and better management practice.

vii) This breed is preferred for upgrading nondescript cattle in hill areas or high land areas.

viii) Lactose in milk is 4.9 %.

BUFFALO

As 80-85% buffalos are non-descript, yielding on an average not more than 1.5 litre of milk per day in contrast to an average 7.8 litre of daily milk obtain from well breed milk animal.

Terms in related to buffalo: -

Species --- Bovine

Group --- herd

Adult male --- Buffalo bull

Young male --- Buffalo bull calf

Adult female --- She buffalo

Young female --- Buffalo Heifer Calf

New born --- Buffalo calf

Castrated male --- buffalo bullock

Castrated female --- spayed

Female with his offspring --- calf at foot

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Act of parturition --- Calving Act of mating --- Serving

Sound produced --- bellowing Pregnancy --- gestation

Domesticated buffaloes are classified into two main categories:-

1. Swamp buffalo:- Chromosome no.48 (2n)
2. River buffalo:- Chromosome No. 50 (2n)

Wallowing:- It means rolling or foundering in mud area or in water. The river breed of buffalo prefers the clean water of stream and pools bunching together but the swamp buffalo of china and south-east Asia like to wallow in slime, in the mud whole commutating one animal or very few animal only. Buffalo apparently wallow for to make reason:-

1. To regulate body temperature.
2. Regulate parasites.

There is no definite pattern of wallowing generally color of switch of tail of buffalo is white. The marketable age of buffalo is 14-18 months.

Classification of buffalo:-

1. Murrah Group:-
   a) Murrah
   b) NiliRaavi
   c) Kundi
   d) Godaveri
2. Gujrat Group:-
   a) Surti
   b) Jafrawadi
   c) Meshana
3. Central India Group:-

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a) Nagpuri
b) Pandispuri
c) Manda
d) Jarnagi
e) Kalhanda
f) Somalpur

4. Uttar Pradesh Group:-
   a) Bhodapuri
   b) Tarai
5. South India Group:-
   a) Toda
   b) South Canra

Domesticated buffalo is also known as water buffalo or Riverine buffalo. This buffalo has 50 numbers of chromosomes. World population of buffalo is about 180 million and India passes more than 50 % of it. Life span of buffalo is about 15-20 years but the reproductive life is 10-15 years. All the terms used in cattle are also applicable to buffalo.

1. Murrah :-

   Home tract:-Rohtak, Hisar, Jind, Sonipatdistt. of Haryana. Along with some part of U.P, Rajasthan and Punjab.

   Characters:-

   i. As the name indicates the color is jet black except switch of the tail which is white.
   ii. Horns are short and tightly covered.
   iii. Long tail reachesupto fat lock joint mostly.
   iv. Udder is well developed.

MRCVS MRCVS MRCVS

v. Height is upto 130-145 cm.
vi. Average lactation yield is 1800-2000 kg.
vii. Massive body frame but head and neck are light.
viii. Hooves are broad.
ix. Weight of adult male is 600 kg and of adult female is 500 kg.

2. Nili-ravi:-

Home tract:-Firozpur dist. of Punjab, Multan and Bahwalpur of Pakistan.

Characters:-

i. Milk yield average is very near to murrah i.e. 1600-1800 kg.
ii. Heavy head bulging at the top but depressed between the eye.
iii. Colour is black or brown with pink or white marking on udder, brisket, forehead, legs and muzzle.
iv. Most of the animals have bright eyes i.e. white around marking in the eye.
v. Horns are curved but not tightly.

3. Surti:-

Home tract:-Surat, Kaira, Baroda and Ananddistt. ofGujrat.

Characters:-

i. Weight of adult male is 600 kg and of adult female is 450 kg.
ii. Lactation yield is 1600 kg.
iii. Broad and long head with convex shape.
iv. Main point of differentiate is sickle shaped horns growing downward and backward and pointing upward.

MRCVS MRCVS MRCVS

v. Color is black and brown for skin but color of hair is brown to silver grey.
vi. Long tail with white switch.

4. Mehsana:-

Home tract:-Mehsanapalanpur and Banaskanthadistt. ofGujrat.

Character:-

i. It is a mixture of murrah and surti breed.
ii. Horns may resemble with surti and murrah.
iii. Medium sized body.
iv. Skin color is black and brown grey with white marking on face, leg and tail.
v. Average lactation yield is 1600 kg.

*NBAGR:- National BureauOf Animal Genetic Research Karnal

*Bunny:- Latest buffalo Indian breed.

5. Jafarabadi:-

Origin: - Junnagarh, Jamnagar and Kutch area of Gujarat.

Character:-

i. Mostly animals of this breed are reared for ghee production of high fat percentage.
ii. Black in color.
iii. Prominent forehead with heavy horns. Inclined to drop on side of the neck it means no tight curling of horns.
iv. White marks on leg and face.
v. Average lactation yield is 1800 kg.

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5. Bhadawari:-

   Origin :-Bhadawari estate of dist. Agra, Etawah dist. of U.P and Gwalior dist.of M.P.

   Character:-

   i. Medium body size, small head and most peculiar feature of this breed, skin color is copper colored with scanty hair.
   ii. Average lactation yield is 1000 kg with more than 10% fat.
   iii. Average weight of adult male is 475 kg and female is 375 kg.

6. Nagpuri:-

   Origin:- Nagpur, Wardha, Amravati and Akola dist.of Maharashtra.

   Character:-

   i. Black color with white marking on face and leg.
   ii. It is lighter breed than other northern breed with heavy brisket region.
   iii. Peculiar feature of this breed is long flat, curved horn reaching upto shoulder.
   iv. Avg. weight of adult male is 500 kg and female is 400 kg.
   v. It is a low milk yielder.

7. Pandherpuri:-

   Origin:-South Maharashtra, Andhra Pradesh and Karnataka.

   Character:-

   i. Animals are of medium size.
   ii. Horns are long flat and usually twisted.
   iii. Males are used for draught purpose.

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8. Manda:-

   Origin:- Thick forest of Orissa and Andhra Pradesh.

   Characters:-

   i. Brown or gray color with yellow tuft of hair or knee and fat lock joint.
   ii. Eyes are broad with red margin.
   iii. Horns are semicircular.
   iv. Mostly used for draught purpose.

9. Sambhalpuri:-

   Origin: - Bilaspurdist.of Madhya Pradesh.

   Character:-

   i. Color may be black, brown or grey.
   ii. It is reared for milk as well as draught purpose.

10. Kalahandi:-

    Origin:- eastern part of Andhra Pradesh and adjoin Orissa.

    Characters:- Body color is grey so it is more heat prominent.

11. Jerangi:-

    Origin:-Jerangi hills of Orissa.

    Character: - It is a dwarf breed (4 ft. height)

12. Toda breed:-

    Origin:- It is reared by Toda tribes in Nillgiri hills.

    1) It is only animal which fight with tigers.
    2) Thick growth of hairs like mane.

According to their size, body weight and morphological characters of buffalo breeds can be classified into three categories:-

A. Large size:-Murrah, Nilliravi, Banni, Jaffrabadi.

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B. Medium size:-Mehsana, Bhadawari, Sambhalpuri.
C. Small size:-Surthi, Mauda, Jerangi.

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Poultry breeds

- **Poultry:-** The term poultry applies to a rather wide variety of birds of several species and refer to them whether they are alive and dressed. The term applies to chicken, turkeys, ducks, geese, guinea fowl, pigeon and other game birds.
- **Ornithology:-** Ornithology is the study of birds. The domestic fowl is called simply Gallus Domesticus. The ancestors of these domestic chickens originated from south East Asia. Modern domestic breeds are considered to be descendants of jungle fowl found in India and its neighboring countries like Srilanka, China, Myanmar, Java, Sumatra and Malaysia. The four species of wild or jungle fowl are given below:-

I. Gallus gallus
II. Gallus lafayeti
III. Gallus Sonneratii

IV. Gallus Varius

Points remember in poultry:-

1) Like other birds poultry has a coating of feathers, no teeth, sack like appearance and legs with spurs.
2) The presence of comb distinguishes it from other birds.
3) Fowls are having a relatively high breathing and pulse rate.
4) Birds of distinct type and color pattern admitted to the standard are termed as standard breed. They are further divided as class, breed, variety and strain.

Class:-

The term class is use to designate group of breeds which have been developed in certain region or geographically areas.eg- Asiatic class, English class.

Breed:- Breed denotes an established group of birds having the same general body shape, weight and some common characteristics.

- ❖ Variety:- Represents a sub-division of a breed.
- ❖ Strain:- The term strain is used to denote a given breeder who has done the breeding on the birds and has introduced economic characters in the breed.

Zoological classification of poultry:-

Kingdom - Animalia

Phylum -Chordeta

Sub-phylum - Vertebrae

Class - Avies

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Sub- class -Neoornithes

Order - Galliforms

Family - Phosinidae

Genus - Gallus

Species -Gallus domesticus

Number of chromosome = 78 (2n)

Classification of poultry breed:-

1. American class:-
    a) Rhode Island Red (RIR)
    b) New Hampshire
    c) Ply Mouth Rock (PMR)
2. Asiatic class:-
    a) Brahma
    b) Assel
    c) Cochin
    d) Langshan
3. English class:-
    a) Sussex
    b) Australop
    c) Cornish
    d) Orungton
4. Mediterrian class:-

MRCVS MRCVS MRCVS

a) Leghorn
b) Minorca

American Class:-

A. Rhode Island Red (RIR):- Rhode Island Red originated from red island in New England after crossing with Red Malay game, Leghorn and Asiatic native stock.

Characters:-

i. The bird has long rectangular body.
ii. Back is flat and breast is carried well forward. Plumage of Rhode Island Red is rich dark or brownish red in color.
iii. The tail covers sickle feathers and main tail feathers are also black. In the lower neck feathers of the females there is also slight black marking at the base.
iv. There are two varieties of this breed – single comb and rose type comb.
v. Skin and shanks are yellow and ear lobs are red.
vi. Standard weight of cock is 3.8 kg and hen is 2.9 kg.

B. New Hamphsire:- It is a meat purpose breed. It was developed from Rhode Island Red in New Hamphsire, America.

Characters:-

i. The shape of the body of bird is less rectangular than that of Rhode Island Red. Its body is broad, deep and rounded.
ii. The plumage is chestnut red but not so developed as in Rhode Island Red.
iii. Skin and shanks are yellow and ear lobs are red.
iv. Standard weight of cock is 3.8 kg and hen is 3.1 kg.
v. Mostly used as female line in broiler breeding.

MRCVS MRCVS MRCVS

C. Ply Mouth Rock:- It is a meat purpose breed and single comb, originated from America.

Characters:-

i. Birds have good size, long bodies and good depth of body with excellent fleshing properties and good egg laying abilities.

ii. There are 7 varieties of Ply Mouth Rock – Barred, white, buff, silver penciled, blue, partridge and Columbian.

❖ Barred Ply Mouth Rock:- In this variety male birds have black and white bars of equal width. Whereas in females the white bars should be as wide as the black bars.

❖ White Ply Mouth Rock:- the plumage is white through out the body. The variety was well developed from barried variety.

iii. Plumage is greysh white.

iv. Black spots on the shanks are also common, particularly in female.

Asiatic Class:-

a) Brahma:- This is a meat purpose breed, originated in the Brahmaputra valley of India. The breed was developed in India and exported to America and England about 100 years ago.

Characters:-

i. Brahma breed is massive in appearance, well feathered and well proportionate.

ii. They heave Pea comb.

iii. Shanks are feathered. There are 3 varieties of brahma:- Lite brahma, dark brahma, buff brahma.

iv. Standard weight of cock is 5.5 kg and hen is 4.2 kg.

MRCVS MRCVS MRCVS MRCVS

- ❖ Lite Brahma:- This variety is most popular because of its color and size the color pattern of lite brahma is similar to that of Columbian Ply Mouth Rock and Columbian white. The feathers are black with white edging and tail feathers are also black with exception toe feathers of female which are white. The shanks, toes and beak are yellow.
- ❖ Dark Brahma:- In this variety plumage in front of neck is black. The wing is white and primary wing feathers and tail feathers are black in female head and upper neck are silver grey, wing are grey with black penciling and primary wing feathers are black with narrow edge of steel grey. Tail is black except for feathers on the shank, toe, beak are yellow.
- ❖ Buff Brahma:- it has plumage pattern similar to that Columbian Ply Mouth Rock except that golden buffer buff is replaced by white. Its buff feathers are onshank and on the outer toe of each feet.

b) Aseel:- The best specimen of the breed although rare. They are found in parts of Andhra Pradesh, Uttar Pradesh and Rajasthan.
Characters:-

i. Most popular varities are Pella, Yakub, Nurie, Chitta, Java, Sabia, Teekal, Kagar and their color are golden red, black and red, white, black and white spotted, black, white and golden or black with yellow or silver, brown or raza, black.
ii. Wattles and earlobes are bright red and beak is short.
iii. Face is long and cylindrical, not covered with feathers.
iv. Neck is long, uniformally thick but not fleshy, body is round and short with a broad breast, straight back and close set

MRCVS MRCVS MRCVS

strong tail. Generally feathering is close, skanty and almost absent on the breast region.

v. Due to game shape body called as fighter.
vi. Legs are short.
vii. Standard body weight of cock is 5 kg and of hen is 4 kg.

c) Cochin:- Also known as Sanghai fowl. Originated in Sanghai.
Characters:-
i. Massive appearance, thicky feathered shanks, single comb and cushion like structure at the base of the tail.
ii. The popular varities Buff, Partrige, and black & white.
iii. Also known as fancy bird.
iv. Standard body weight of cock is 5.1 kg and of hen is 3.9 kg.

d) Langshan:- It is a grace full bird with well proportionate body. Langshan region of China.
Characters:-
i. Short but deeper body than Brahma and Cochin. Large tail feathers, tail carried high long legs and single comb.
ii. Black and white are the two main varities.
(A) Black
Langshan has dark brown beak, bluish black shanks and toes, pinkish white bottom of the feet.
(B) White
Langshan has greyish white plumage, salaty blue to pinkish white beak, blue shanks and toes with pink between scales.
iii. Standard body weight of cock is 3.8 kg and of hen is 3.4 kg, of cockerel/young male is 3.6 kg and of pullet/young female is 2.9 kg.

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English class:-The breeds of English class origin are mostly utility breeds noted for their excellent properties. With the exception of Cornish all than English breeds have white skin and red ear lobs.

a) Sussex:- Sussex was developed in England in 18th century as a table bird. It was developed from birds with four toes. It has long body, broad head, the shoulders and with good deepth from front to rear. The breast is well developed, the birds have excellent fleshing properties, single comb and horn colored beak, shanks and toes.

The varieties of Sussex are:-

i. Speckled Sussex:- In male has neck which is lustrous reddish. Each feather having a black strip extending length wise.

ii. Red Sussex:- It has red color in both the sexes with exception in primaries where the lower web are black with a narrow edging of red. In the secondaries where the upper web are black and tail which is black. The under color is red with slightly bar in both sexes.

iii. Lite Sussex:- The plumage color is quite similar to that of Columbian Ply Mouth Rock and Ply Mouth Rock and Columbian Wyandotte. This varieties

b) Australop:- The breed originated from black Orpington and was developed in Australia.

Characters:-

i. It is less massive in appearance then the black Orpington.

ii. It has been principle for egg production rather than meat.

iii. It has been developed as layer bird.

iv. The back is long, body slopes gradually toward the tail.

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It has good depth of body, more closely feathered than the Orpington.

v. The comb is single, body is black, plumage is greenish black and beak, shanks and toes are also black.

vi. Standard body weight of cock is 3.8 kg and of hen 2.9 kg, cockerel is 3.4 kg and pullet is 2.5 kg.

c) Orpington:- It is a breed of chicken named after the town of orpington, found in south-east England.

Characters:-

i. This breed is excellent layer with good meat quality. Hence often becomes broody and good mothers.

ii. Although rare heavy they are able to fly some distances but rarely do so.

iii. It is characterized by its long, deep and well rounded body with a full breast and broad back.

iv. Birds are rather low set and heavy in bones.

v. They are more loosely feathered than the breeds of American class. Good laying stains have also being developed the comb is single.

vi. Standard body weight of cock is 4.5 kg and of hen is 3.6 kg, cockerel is 3.8 kg and of pullet is 3.1 kg.

vii. They have many varities and some of them are given below:-

(A) Black

Orpington:- It was evolved in about the black Minorca, langshan and ply mouth rock. The shanks and toes are black and the bottom of feet is white.

(B) Buff

Orpington:- It was evolved from mating involving cochin,

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dorking and golden spankledHamburges. The plumage color is same as other buff breed such as buff ply mouth rock except that shanks and toes are white.

(C) Blue Orpington:- it is very recent origin and has the same general color pattern as blue ply mouth rock. Toes and shanks are blue.

d) Cornish:- Table bird of England. Developed in England about the middle of 19th century from crossing involving the Assel,maleygame and English game breed. It is noted for its close and compact feathering and heavy flesh with distinct shape. The shoulder great width all Cornish bird have pea comb.

Mediterian Class:-

a) Leghorn:- out of the important breeds classified as mediterian breed. The leghorn is most popular breed. It is world egg producer. This breed originated in Italy. It have 12 varities:-

1. Single comb type.
2. Single comb buff.
3. Single comb light brahma.

Characters:-

i. It is small active neatest of all birds.
ii. It is very compact and small in form, carries a tail rather low and has small head and wattles.
iii. It has relatively long back, comparatively long shank.
iv. The single comb of the male should be medium and erect.
v. The white buff and brown varities are sub divided further on the basis of comb. It has single or rose comb.

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vi. All the varities have yellow beak, skin, shanks and toes.
vii. Mature bird weight is 2 to 2.7 kg.

b) Minorca:- This breed is originated called red faced and black Spanish because its resemblance and appear to black Spanish.

Characters:-

i. Minorca is the heaviest and largest breed of mediterian poultry.
ii. They have long strong body long comb large quit ear lobes.
iii. Legs set squarely under the powerful looking body.
iv. The beak, shanks and toes are black.
v. An excellent producer of large white eggs.
vi. Color of the skin is White, shell is chalky white in color.
vii. This breed is at one time even more popular than leghorn because of superior size of its white eggs but now production is line.
viii. Standard weight of cock is 4.1 kg and of hen is 3 kg, cockerel is 3.4 kg and pullet is 2.8 kg.

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GOAT

Goat is also called poor mans cow because it survives on poor, woody vegetation which no other species will consume because:-

i. It has high dry matter and fibre digestibility.
ii. It is less prone to toxic effect of toxic shrubs like lantana camora.

Economic importance :

i. Food-for meat and milk.
ii. Skin
iii. Manure
iv. Fibre production-it is of 3 types..
   a. Hair- Roughest fibre
   b. Mohair-it is soft white wool like fibre& in INDIA 9 breeds produce mohair. Mohair is produced by an exotic breed Angora.
   c. Pashmina- softest fiber.

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Common terms used in goat husbandry:

1. Group of animals- Flock or band
2. Adult male- Buck
3. Adult female- Doe
4. New born- Kid
5. Parturition of new born- kidding
6. Act of matting- serving
7. Sound produced- Bleat
8. Goat meat- Chevon
9. Scientific name- Saprehircus

Goat population in world is 460 million and in INDIA it is population is 127 million. India is on first rank. India milk production from all breed is 146.13 million ton.

Goat breeds are 23 in India and 102 in world.

1. **Northern temperate region :-**

i). Gaddi :

It is found in Kangra, Kullu and Chambadistt of Himachal Pradesh and Dehradun and Nainital district of Uttrakhand. This breed is reared for meat and fibre.

i. Average body weight of adult male is 27 kg and 25 kg of female.
ii. Coat colour is white mostly but black and brown colour is also present.

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iii. Both sexes have large horn directed upward and backward.
iv. Ears are medium size and drooping.
v. Average fleece yield per clip is 300gm and its fibre diameter is 75 u.
vi. It produces coarse hair.

ii). Chegu/chigu:

Origin: Lahol and Spiti valley of H.P. Uttarkashi and Chandoli valley of Uttrakhand.

i. Average wt. of adult male is 36 kg and in female is 25 kg.
ii. Goat colour is usually white but sometimes mix with greyish red.
iii. Horns in both the sexes form semicircle. And it is knowns for pashmina production.
iv. Average yield of pashmina is 120 gm per year.
v. Fibre length is pashmina is 6cm and fibre diameter is 12u.

iii). Changthangi:

It is found in Changthang region of Ladhak and Lahol and Spiti valley of H.P.

i. Due to its small size this goat looks pretty. Due to this fast movements and fine fibre because it produces from best pashmina.
ii. Horns are same as in chegu breed.
iii. Avg. pashmina production is 200 g per year which is used for Kashmiri shawl of high quality.

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iv. Goat of this breed is also used for meat production.
v. Goat colour is mostly white but black colour is also present.

2. **North-western dry region:-**It includes Punjab, Haryana, Rajasthan, Delhi, Uttar Pradesh, Gujarat, Madhya Pradesh and Chhattisgarh. This region has largest goat population in India. It means it contains 43% goat population of India.

i. Jamanapari:- It is biggest goat breed among the indigenous breed. Its origin is between Ganga, Jamuna and Chambal River. Pure stock of jamanpari breed is available in Etawah district of U.P. and also found in Agra & Mathura district of U.P.

Characters:-

I. Average body weight of male is 50-60 kg and of female is 40-50 kg.
II. Body color is variable ranging from light yellow to light brown. Patches of black or tan color on neck and back may also be found.
III. Typical character of this breed is Roman-nose or Parrot-mouth appearance. (Highly convex nose line with tuft of hair).
IV. Ears are long, flat and drooping.
V. Both sexes are horned.
VI. Well developed udder with long conical teats.
VII. Milk yield ranges from 1.5-2 kg per day.
VIII. Dressing percentage is 45-48 % at 9 month of age.

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ii. **Barbari:-**It is the dwarf breed among the indigenous breed. It is reared along with Jamanapari and also Bharatpur district of rajasthan.

Characters:-

I. Average body weight of male is 40 kg and of female is 25 kg.
II. It is one of the promising dairy purpose breed. That's why it is most suited for stall feeding in the urban areas.
III. Average daily milk yield is approx. 1 liter.
IV. Both the sexes have twisted horn.

iii. **Beetal:-**It is found throughout the Punjab and Haryana. It is also a dairy breed. It is second to Jamanapari in size but superior to Jamanpari with respect to adaptation.

Characters:-

I. Color is mostly black or brown.
II. Medium sized horn.
III. Male posse beard.
IV. It's length is 80 cm.

iv. **Surati:-**Origin is Surat and Baroda district of Gujarat. It is also a dairy breed under stall feed condition because it is a good converter of waste and residual food.

Characters:-

I. Color is white

v. **Marwadi:-**Origin is Marwad region of Rajasthan (Jodhpur, Bikaner and Jasalmair). It is wool purpose breed. Color is jet black.

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vi. **Mehsana:**- Origin is Mehasana and Gandhi Nagardistrict of Gujarat. It is a dairy purpose breed.

vii. **Jakhrana:**- Origin is Jakhrana tehsil of Alwar district of Rajasthan. It is dual purpose breed. This breed is very similar to beetal breed but jakhrana goats are little longer than beetal. It's length is 85 cm.

viii. **Kutchi:**- it is found in Kutch district of Gujarat. They are reared for milk and hair.

ix. **Sirohi:**- Origin is Sarohi district of Rajasthan.

x. **Jhalawari:**-Jhalwar district of rajasthan.

3. **Southern region:-** It comprises of states of Maharashtra, Karnataka, Tamil Nadu and also some area of Kerala and Andhra Pradesh. In this region 30% of goat population is present.

i. **Osmanabadi:-** Goats are distributed in Latur and Osmanabad district of Maharashtra.

Characters:-

I. Average body weight of adult male is 30-35 kg.
II. Goats are large in size.
III. Color varies from black, brown, white or spotted.
IV. It is reared for milk as well as meat purpose.

ii. **Malabari:-**It is reared at Calicut, Malapuran district of Kerla.

Characters:-

I. It is medium sized animal.
II. No uniform color.
III. These goats are reared for meat purpose and for their skin.

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iii. **Sangamneri:-**Commonly found in Pune and Ahmad Nagar of Maharashtra.

Characters:-

I. There is no uniform color.
II. Goats are reared for milk as well as meat purpose.
III. Average milk production is 1 kg per day.
IV. In meat dressing percentage is 46 %

iv. **Kodaiadu**

4. **Eastern and north east regions:-**This region comprises of Bihar, West Bengal, Orissa, Assam and other North east states**.**

i. **Bengal:-** It's origin is all of the eastern region including West Bengal, Bihar and Orissa.

Characters:-

I. Short legged compact body.
II. Color may be black, brown, grey and white. Black color is most prominent and on the bases of this color a separate breed "Black Bengal" has been evolved.
III. This breed is known for mutton quality and for its skin which is used in industries.

ii. **Ganjam:-**Origin is Ganjam and Koraput district of Orissa.

Characters:-

I. They are tall animal.
II. Color is mostly black.
III. Both the sexes have long, straight horn.
IV. It is reared for mutton purpose and milk production is very poor.

iii. **Assamese:-**Origin is Assam.

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Exotic breeds:-

i. **Saanen:-**Origin is North-west Switzerland.

Characters:-

I. This breed is known as milk queen of goat world.
II. Average milk production is 3 kg per day.
III. Color of body is white or cream.
IV. It posses pendulous udder.
V. Short leg as compare to body. It is a polled breed.
VI. Average weight of buck is 80 kg and of doe is 60 kg.

ii. **Alpine:-**Origin is Africa.

Characters:-

I. Body weight of male is 80 kg and of female is 60 kg.
II. This breed has been produced by crossing of Swiss and British breed.
III. Average milk production is 1.3 kg per day.

iii. **Anglo-Nubian:-**It is a cross of European and jamanapari. This is a heaviest breed of goat world.

Characters:-

I. It is dual purpose breed and most suited for India.
II. Average milk production is 3 kg per day.

iv. **Angora:-** it is a European breed and it is known for fiber production which is called Mohair. Mohair production is 3 kg annually.

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SHEEP

Sheep population in India is 71.5 million. And India's number in world is 3rd. India's population is 5.5% of world population. In India sheep population is concentrated in the state of Andhra Pradesh, Rajasthan, UP, Haryana, Punjab and Himachal Pradesh etc. There are 42 breeds in India and 800 breeds in world.

- Chromosome number in sheep is 54.
- Onset of puberty 4-12 months.
- Length of estrus cycle 14-20 day.
- Duration of estrus is 24-48 hours.
- Gestation period is 150 days.
- Breeding life is 5-8 years.
- Scientific name is Ovis Aries.
- Group of animal is called flock.

- Adult male is called ram or tup.
- Adult female Ewe.
- New born is called lamb.
- Act of mating tupping.
- Sound produced bleating.

EconomicImportance:-

1. Food:- In the shape of milk or by meat, wool, skin etc.
2. Skin:- for leather manufacturing.

Indigenous sheep has many desired characters over exotic breed such as:

- Diseases resistance.
- Better tolerant to heat and humidity.
- Efficient feed converter.

Four region for sheep Husbandry :-

1. **Northern temperate region:-** It includes Jammu & Kashmir, Himacchal Pradesh and area of Uttrakhand.

   Characters :- It is small size due to this region these are good climber. Flock of these animal graize high mountain, in summers and comes to lower slop in winters. Thus the flocks are migrated types. When flock moves to high mountains, sheep produce good quality of wool. When sheep graize in lower slop the wool produced will be coarse/rough wool.

   i. **Gaddi:-**

   Origin:-Kullu, kangra and chamba valley as the name indicate such sheep are reared by Gaddi nomads whose occupation is mostly sheep rearing. Adult body weighs 24-25 kg. Wool is

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clipped/shearing is done three times in year. Yield of annual wool is 1-1.5 kg that is called fleece.

Wool grading are done by three types of criteria :-

- Annual production of wool is called fleece.
- Length of wool is called staple length.
- Diameter of wool fiber is measured in micron.
- Mostly color of sheep is white and colored face.
- Short tail and ear.

ii. **Bhakarwal:-** It is maintain by Bukkarwal Tribes and wool production is 1.5-2 kg.

iii. **Gurej:-** Sheep found in this area are biggest among Kashmir. Animal found in Gurej tehsil in Kashmir. It is reared for superior mutton production.

iv. **Poonchi**

v. **Karnah**

vi. **Kashmiri merino:-** It is produced by different type of merino and Indian breed of Gaddi, Bukhrwal and Poonchi. Wool production of this breed is as follow:
Six monthly fleece Weight is 1.2 kg.
Staple length is 15.6 cm.
Average fiber diameter is 20 micron.

2. **Breeds of north-western Arid zone (dry western zone) :-**

It includes Rajasthan, South-east Punjab, Haryana, Gujarat, Western Uttar Pradesh, Madhya Pradesh and Chattishgarh. Wool quality of these sheeps is not so fine. So, wool is used for carpet industries. Climate in this zone is extremely hot during summer and fairly cold during winter. Rain fall is low to moderate. So, flocks are

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stationary, semi-migratory or migratory type depending upon the status of farmer and availability of pasture land. Sheep population in Punjab and Haryana is declining year to year as more and more land is being used for intensive cropping.

Characters :-

1. Ears are leaf like and medium sized.
2. Color is mostly white although some brown or black patches may be seen.
3. Wool is coarse & long which is good for carpet and some garments.
4. Annual fleece weight is approximately 2 kg.
5. Fiber length is 6 inches.
6. Fiber diameter is 24 micron.

I. Magra :-

Origin :- Bikaner, Churru and Nagordistt. of Rajasthan. Average weight of mature ram is 33 kg and average weight of mature ewe is 25-30 kg

II. Nali :-

Origin :-Ganganagar, Churru and Jhunjhunudistt. of Rajasthan and Haryana. Its body size is quite large i.e. average weight of ram can go to 40 kg.

III. Chokla :-

Origin :- This breed produce finest wool among all Rajasthan's breed. It origin from Sikkar, Nagor, Churru and Jhunjhunudistt.of Rajasthan.

IV. Munjal :-

Origin :- It is found in Hisar, Rohtak and Karnaldistt. of Haryana and in Punjab.

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V. Hisar dale:-

Origin :- this breed has been developed at Govt. Livestock Farm, Hisar. It is a cross of rams of Australian Merino and ewes of Magra/Bikaneri. In this breed exotic inheritance is 75%.

- Other breeds of this region :-

Marwari/Jasalmeri, Sonadi (Udaypur region), Kathiawadj, Mallpuri (Jaipur and Tonk region).

3. Southern region :-

It includes Maharashtra, Andhra Pradesh, Karnataka and TamilNadu. In this region basically two types of sheeps are reared.

(a)Sheep producing coarse wool.

(b) Sheep for meat purpose.

I. Decani :-

Origin :- South-eastern part of Maharashtra and Andhra Pradesh.

Characters:

i. Medium to large in size.

ii. Color is mostly black but in some animals grey color is found.

iii. Production Average yield of fleece is 700 g which is coarse wool and can be used for rough blanket.

II. Bellary :-

Origin :- Bellary distt. of Karnataka. Also found in some areas of Andhra Pradesh.

Characters :-

Similar to Deccani breed except color is black with white patches.

III. Nellore :-

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Origin:- It is originated from Nellore distt. of Andhra Pradesh. It is tallest breed of sheep in India that's why it looks like a goat. Body hairs are short, which are never shorn. Long face, long ears and two long appandages coming out from the throat region. Average weight of ram is 40 kg and average weight of ewe is 30 kg. This breed is used only for meat purpose.

IV. **Mandya:-**

Origin :- It is also a large breed and it is reared for meat and milk purpose.

V. **Kenguri:-**

Origin:- It is found in karnatka.

VI. **Mecheri:-**

Origin:- It is from Tamil Nadu and it is a meat purpose breed.

VII. **Madras red**

VIII. **Coimbatore**

IX. **Hassan**

X. **Nillgiri:-**

Origin:-Nillgiri is cross breed produced from local breed and a Cheviot breed by the East India Company officers.

4. Eastern region:-

It includes Bihar, Jharkhand, West Bengal, Orissa, Sikkim and north-east states. Mostly all the sheep produce extremely coarse and hairy wool but in the pocket of Sikkim and Arunachal Pradesh a breed Tibetan produce good carpet wool and good apparel wool.

Characters:-

1. They are white in color with brown or black face.
2. Leg, face and belly are devoid of wool.

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3. Average wool production 500 g per clips.

Other meat purpose breed :-

1. Shahabadi:- Shahabad distt. Bihar and West Bengal.
2. Chhotanagpuri:-ChhotanagpurDistt. Bihar.
3. Ganjam:- Found in Orissa.
4. Bolangir:- found in Orissa.
5. Carole:- 24 Pargnadistt. of West Bengal.

Exotic breeds of sheep:-

1. **Merino:-** Origin is from Spain also Found in Australia and Germany. Average weight of the ram 60 kg and Ewe's 55 kg. Another character is, it is the fine wool breed of the sheep in World and fleece production may reach 10 kg per year. Another feature is wrinkled/fold of skin. This breed is very hardy to adverse weather and poor grazing.
2. **Rambouillet:**- Origin is France but developed from Spanish Merino. Its size is greater than Merino. Average weight of ram is 100 kg and average weight of ewe is 70 kg.It is also a fine wool breed of sheep but wool is next to merino.
3. **South down:**- It is oldest English breed.
4. **Lincolin:**- Origin from England weight of ram can reach upto 150 kg and fleece weight is about 5 kg per year.
5. **Liecester:**- Average weight of ram is 100 kg and weight of Ewe is 80 kg. This breed is use for wool as well as mutton of sheep.
6. **Corridale:**- it is also a dual purpose breed. Wool production may reach upto 5 kg per year. Average weight of the ram is 80 kg. It

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was developed in Newzeland and it is a mixture of Merino and Lincolin.

Cross Breed:-

1. Nilgiri
2. Hisar dale
3. Avivastra:- cross breed having 50% exotic inheritance. It developed by scientist's of Central Sheep Wool Research Institute by crossing of Cholka/Nali with Merino/Rambouillet.
4. Avikalin:- It is also developed by CSWRI with 50 % exotic inheritance by crossing of Malpura with Rambouillet.
5. Harnali:- In this breed 50 % exotic blood is maintain and it is a cross of Nali with Corridale, developed by LUVAS, Hisar.

PIGS (SWINE)

SusDomesticus - It is fast growing and high prolificacy. It is most efficient domestic animal converting feed stuff, household and agriculture waste into animal protein or edible meat. So indigenous pigs are cheapest producers of meat. Hence is producer of animal protein to weakest section of the society. Earlier meat of pig was avoided due to its dirty behavior but with the latest and scientific management government has established meat processing plant and bacon factories. There are 82 pig breeding farms in India.

Common terms:-

Adult male – Boar

Adult female – Sow

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New born – Piglet

Group of animals – litter

Act of parturition – Farrowing

Act of mating – Coupling

Sound producing – Grunting

Meat of pig – Pork

Gestation period – 114 days

Number of breed in world – 60

Number of breed in India – 2

Population in India–13.5 million.

- **Economic importance:-**

1. Meat purpose.
2. Skin industries
3. Feed for fish industries

Indigenous pigs are collectively called “Desi Pigs”

- **Desi pigs:-**It forms the main component of pork production in India.

Characters:-

i. There is wide variation in its phenotype, color pattern, growth rate under different agro-climatic conditions of India.

ii. Litter size may vary from 8-18.

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iii. Its adult body weight may vary 15-180 kg. So, some degree of selection has been made by the farmer itself like in Kerala 'Ankamli' strain has been developed. 'Ghori' In West Bengal and Assam. 'Ghunghroo' in Darjeling and Siliguri district of West Bengal. 'Mali' in Manipur and Tripura. 'Nian-Megha' from north east state. But out of these strain NBAGR (National Bureau of Animal Genetics and Resources) Karnal has characterized only two strain as a breed. First is Ghunghroo and second is Nian-Megha.

Exotic breed of Swine:-

1. **Large white Yorkshire:-**Origin is Yorkshire in England.
   Characters:-
   i. Entirely white in color however black spot are not counted as a defect.
   ii. Large face and broad snout.
   iii. Mature boar weight is 300-400 kg and sow's weight is 250-300 kg.
   iv. Skin is free from wrinkles.
   v. In Haryana this breed has been maintained in pig breeding farm GLF Hisar.
   vi. It is good bacon breed. Sows are good milker. So that large litter size is maintained.

2. **Middle white Yorkshire:-**Origin is same.
   Characters are same but it has been developed to achieve slaughter weight at early age and high percentage of meat to bone.

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3. **Berkshire:-** Originated in Berkshire in England.
   This breed is used for upgrading of indigenous breed in south.
   Characters:-
   i. Black in color and with six white points i.e. feet, nose,Tail.
   ii. Average boar weight is 275-375 kg and sow weight is 200-300 kg.
4. **Landrace:-**Originated in Denmark.
   It produces highest quality of bacon in world.
   Characters:-
   i. White in color, short legs and heavy ears.
   ii. There is very less fat on back which form long narrow body and good quality of meat.
5. **Duroce:-**Originated U.S.A.
   Characters:-
   i. Color shades vary from golden to cherry red.
   ii. Growth rate is good and excellent feed conversion efficiency.

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Solve the following

1. **Given data**

a) Breeding Bull	- 10		
b) Milch animals	- 50		
c) Dry animals	- 25	Find out	-(1) Herd life
d) Heifers	- 30		(2) Herd Average
e) Calves	- 33		(3) Wet Average
f) Milk yield	- 800 Kg		

2. **Given data**

a) Breeding Bull	- 05		
b) Milch animals	- 45		
c) Dry animals	- 35	Find out	-(1) Herd life
d) Heifers	- 38		(2) Herd Average
e) Calves	- 42		(3) Wet Average
f) Milk yield	- 810 Kg		

3. **Given data**

c) Breeding Bull	- 05
d) Milch animals	- 75

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c) Dry animals - 45 Find out -(1) Herd life
d) Heifers - 45 (2) Herd Average
e) Calves - 72 (3) Wet Average
f) Milk yield - 1200 Kg

(A) Given Data :-

1. D.O.Birth 25/04/2004
2. D.O.1st Service 12/08/2007
3. D.O.1st Calving 24/06/2008
4. D.O.Serviceafter 1st Calving 28/08/2008
5. D.O.declayered dry 29/04/2009
6. D.O.2nd Calving 02/07/2009
7. 1st Calving lactation Yield 2600 Kg

Find out - a) A.F.C
b) Service Period
c) Calving Interval
d) Lactation Length
e) Dry Period

(B) Given Data :-

1. D.O.Birth 20/02/2002
2. D.O.1st Service 15/06/2005
3. D.O.1st Calving 18/04/2006
4. D.O.Serviceafter 1st Calving 28/07/2006
5. D.O.declayered dry 21/04/2007

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6. D.O.2nd Calving **09/06/2007**

7. 1st Calving lactation Yield **2800 Kg**

Find out - a) A.F.C

b) Service Period

c) Calving Interval

d) Lactation Length

e) Dry Period

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