

# AGRICULTURAL SCIENCE

## ANIMAL REPRODUCTION

This is a process by which farm animals raise or reproduce offsprings of their own species to ensure continuity.

### Reproductive Hormones and their Functions

**Hormones:** These are chemical substances produced in the bodies of organisms which encourage growth or control the functions of organs.

**Reproductive hormones:** These are hormones which aid in animal reproduction. Reproductive hormones in farm animals is divided into **male and female** reproductive hormones.

### Male Reproductive Hormones – Androgen (Testosterone)

#### Functions

- i. It stimulates the development of male secondary characteristics and sex behaviour
- It influences nitrogen retention and protein synthesis.
- It promotes production of sperm.
- It promotes the growth of accessory sex glands such as seminal vesicle and Cowper's gland.

### Female Reproductive Hormones

#### OESTROGEN

##### Functions

- i. It stimulates the functions of female characteristics.
- ii. It helps in the production of heat – willingness of the female to accept the male.
- iii. It increases the blood supply and water content of the uterus.
- iv. It stimulates the growth of the duct system in the udder.

#### FOLLICLE

##### Functions

- i. It stimulates the growth of the ovarian follicle.

#### LUTEINIZING HORMONE (LH)

##### Functions

- i. It causes the rapture of the follicle and subsequent release of ova.
- ii. It stimulates the secretion of ovarian hormones such as oestrogen and progesterone.

#### PROGESTERONE (PREGNANCY HORMONES)

- i. It ensures the development of uterus and the implantation of fertilized ovum.
- It inhibits oestrus-ripen of more follicles.
- It ensures the continuance of pregnancy.

#### 5. OXYTOCIN

- i. It helps in the contraction of uterine muscles during pregnancy.
- It affects mammary gland after birth by causing milk let-down or milk production.
- It promotes the transport of spermatozoa in the female genital tract.

## 6. RELAXING FUNCTIONS

i. It causes the relaxation of the ligament during parturition for easy passage of young ones/offspring.

### The Process of Reproduction in Mammals

These involve coition, development, nutrition, respiration of embryo and birth of the young.

**Function:** it inhibits the process of lactation.

## REPRODUCTIVE SYSTEM IN LIVESTOCK

### The male reproductive system

i. **Scrotum** – It houses and protect testes.

**Testes** – It is the main male reproductive organ that produces sperm.

**Epididymis** – Stores the sperm where they undergo maturity.

**Secrete** – Male sex hormone testosterone.

**Vas deferens** transports sperm from the epididymis to seminal vesicle

**Seminal vesicle** secrete semen on sperms for motility and nutrition.

**Prostate gland** – Adds prostrates fluid to sperm for motility and nutrition (fructose) for motility.

**Cowper's gland** adds Cowper's fluid which cleanses the urethra of traces of urine and acidic substance before ejaculation.

**Urethra** is urino-genital organ. It transport urine from urinary bladder to exterior.

**Penis** is the male copulatory organ.

### B. The Female Reproductive System

i. **Ovary** – It is the main reproductive organ in female which produces ovum and oestrogen.

**Fallopian funnel** – It receives the ripe egg cell after ovulation.

**Fallopian tube (oviduct)** – is the site where fertilization occurs.

**Uterus** is responsible for implantation of zygote.

**Cervix** aids in easy passage of foetus during birth.

**Vagina** is copulatory organ in females.

**Vulva** – A vaginal part which leads to exterior of an animal.

## Processes of Animal Reproduction

i. **Heat period** – it is the period when a female animal shows signs of readiness to receive the male for mating.

Stages (a) proestrus (b) estrus (c) meta estrus (d) diestrus.

### Signs of Heat

i. Restlessness ii. Loss of appetite iii. Mucous discharge from vulva of other females

**Oestrus cycle** – it is an interval between one heat period and the beginning of another one.

Ovulation is the release of mature ovum from the ovary.

Mating is the copulation between male and female animal. It is of two types (a) Natural mating (b) artificial insemination

Fertilization – It is the fusion of the male and female gametes to form a zygote.

Gestation period is the interval between conception and parturition.

Parturition is the act of given birth to young ones in farm animals.

8. **Lactation** – it is the process of milk let down from female animal after parturition.

## Stages of animal reproduction

Heat period → ovulation → mating → fertilization → gestation period → parturition → lactation

**Colostrum** – This is the first milk produced during lactation that is very important to newly born animals used in the first 4 – 6 days after parturition.

## Importance of colostrum

- i. It has more nutrient than ordinary milk
- ii. It acts as a laxative
- iii. It contains antibodies which provides immunity for newly born offspring.

## Mammary glands and Lactation

These are organs made for producing milk for young animals. In lactation, oxytocin stimulate the process while the site for milk synthesis and secretion is the alveolus.

## Stages of lactation are

Milk in alveoli → small ducts → large ducts → gland (milk) cistern → teat cistern → teat canal → to the outside of udder for collection.

## PROCESS OF EGG FORMATION IN POULTRY

1. Ovary is responsible for producing yolk (ovum)

	Region of the reproductive system	Part of egg deposited on yolk	duration
1.	Infundibulum	Chalaza	-
2.	Magnum	albumen	3 hours
3.	Isthmus	2 layers egg shape of egg membrane	1 hour
4.	Uterus	Shell	20 hrs
5.	Vagina	Secretion of mucous on the egg before laying	

## ENVIRONMENTAL PHYSIOLOGY

This refers to the effects of the environment on the growth and performance of farm animals.

High temperature leads to proper development of chicks.

High temperature reduces positive performance of farm animals.

High temperature reduces feed intake.

Low temperature leads to retarded growth.

Low temperature leads to poor growth

High temperature leads to increase of vector which transmits pathogens.

Relative humidity leads to heat stress.

Relative humidity leads to increase in feed take.

Wind aids in spread of diseases causing organisms.

## Effects of changes in climate on reproduction

Heat stress causes abortion in animals.

High temperature decreases frequency of mating.

It reduces ovulation and heat period.

High temperature leads to low rate of conception.  
High relative humidity increases reproduction.  
High light intensity causes heat stress.  
Moderate light controls sexual maturity.

### **Effects of changes in climate on milk production**

High temperature reduces the rate of milk production in farm animals.  
High temperature do not favour the raising of dairy animal.  
High relative humidity leads to increase of tse-tse fly which transmits trypanosomiasis.  
High relative humidity favours the growth of pathogens.

### **Effects of changes in climate on egg production.**

High temperature reduces feed intake  
Low temperature increases feed intake.  
High temperature reduces spermatogenesis and libido in males.  
Low temperature decreases water intake.  
Moderate temperature is necessary for incubation.  
High temperature lowers egg production

### **Control of temperature**

Introduction of fans and air condition.  
Provide enough windows for ventilation.  
Conserve heat by covering windows with clothing.  
Use poor conductors of heat as roofing sheets.  
Introduce lanterns and heaters.

### **Control of relative humidity**

Fixing of humidifiers to increase humidity.  
Allow free ventilation when humidity is high.  
Avoid spilling of water in poultry houses.

### **Control of light**

Provide extra illumination during short day light.  
Cover windows with dark cloth to reduce light intensity.

## **LIVESTOCK MANAGEMENT**

Livestock management is the raising and production of farm animal for food, income and economic purposes. Examples of farm animals are cattle, sheep, goats, pigs, rabbits, poultry, birds and guinea pig.

### **Requirements for Cattle Management**

1. **Housing** – i. a conventional barns    ii. Loose housing    iii. free range.
2. **Feeding** – Types of feeding.

a. **Extensive system** is where cattle are allowed to move/roam about in order to search for food for themselves.

## Advantages of extensive system

- i. Cheap to practice
- ii. Low labour

## Demerits of extensive system

- i. Low output
- ii. Exposure to pest and diseases
- iii. Indiscriminate mating

**b. Intensive System:** This refers to the system in which cattle are kept indoors and provided with other growth factors.

**c. Semi-Intensive Factors:** It is the system whereby cattle are fed partly intensive and partly extensive.

3. **Hygiene** – Provide fresh feed
- ii. Wash feeders and drinkers properly after use.
  - iii. Clean the floor regularly
  - iv. Sanitization
  - v. Ventilation

Other management practices include weaning castration, identification, culling, dehorning, dipping, vaccination and breeding.

## Disease control

- i. Use disease resistance species.
- Quarantine method.  
Spraying insecticides at animal houses to eliminate vectors.  
Periodic vaccination.  
dipping of animals.

## Requirements for Poultry Management

### Housing involves

i. Open **range system** – this is where animals are allowed to roam about to search for food, water and other needs.

Fold **system** – this involves putting birds in a portable cage by Fulani herdsmen.

**Restricted range** – it has both intensive and extensive system.

Deep **litter system** – is an intensive system where birds are confined in houses which their floors are covered with saw dust or straw.

Battery **cage system** – it is also an intensive system where birds are kept in cages and provided with food and growth needs/factors. It is most efficient and productive system of housing.

## Advantages of battery cages

- a. High productivity
- b. Efficiency in disease control
- c. Efficient control of age-graded birds
- d. Provision of best medical services

## Demerits of deep litter

- i. It encourages egg-eating
- ii. It leads to cannibalism
- iii. Poor supervision of age-graded birds

## Reasons for good housing

- i. To protect the birds against adverse weather conditions.
- To protect the birds against diseases attack.  
It protects the birds against attack by wild animals and hawks.  
It encourages high productivity.

## **Feeding**

Feeds (balanced ration) is always made available in feeding trays while clean water is provided in drinkers.

**Feeding of chicks** - 1-day old – 4 weeks' starters mash.

**Feeding of growers** - Growers mash – 8 weeks – low in protein to prevent excessive growth.

**Feeding of layers** – Layers mash is given, which is high in protein for proper growth and rich in bone meal or oyster shell to provide calcium and phosphorus for formation of hard egg shell.

## **Hygiene:**

- i. Wash the drinkers and feeders thoroughly.
- Remove cobwebs if any.  
Provide fresh uncontaminated feeds regularly.  
Vaccination and administration of drugs.

## **Other management practices**

They are incubation, debeaking, culling, candling, brooding, dubbing and veterinary services.

## **5. Diseases control**

- i. Remove sick or dead birds from the house.
- Disinfect other buildings regularly.  
Provide foot dips bathed with chemical to prevent infection of house by visitors.  
Dip birds infested with ecto parasites in a chemical bath.  
Remove wet litters and mouldy feeds.  
Deworm infected birds to remove endo-parasites.

## **Requirements for Pig Management.**

### **1. Housing**

For intensive system, pigs are raised in houses with sties provided with feeding and drinking troughs as well as wallowing unit.

It has low walls with concrete or stone slab floor and with asbestors, galvanized iron and aluminum sheets. Creep areas should be partitioned from the fallowing pen to prevent sows from eating food for piglets. Fallowing pens should have rail guards.

### **2. Feeding**

- i. This takes up 70-80% of production cost.
- Balanced rations should be given to pigs of all categories (boar sow, piglets).  
Breeders mash should be given to breeding pigs.  
Ensure flushing of breeding pigs (sow and gilt) within 7 – 10 days before parturition.  
Feed should be given to piglets 2 weeks after birth to promote rapid growth.  
Weaners mash should be given to piglets immediately after weaning.  
Pigs for pork should be given fatteners mash (2kg for/pig per day up to market size. (7 months).  
Supplementary feeds such as grasses, food remains, brewery waste etc are given to pigs.

## **Hygiene**

- i. Clean feeders and drinkers regularly.
- Isolate any sick animal for treatment.  
Remove and bury dead animals.  
Scrub the floor of pig house.

### **Prevention (control of diseases)**

- i. Sanitation
- ii. Disinfect the pig house regularly
- iii. Deworm pigs using drugs
- iv. Vaccination

## **RABBIT MANAGEMENT**

### **1. Housing**

i. Rabbits are kept in hutches, well ventilated and arranged in single, double or triple lines within a house called **rabbitry**.

Hutches, not higher than three feet for easy management practices.

Wooden or metal hutches netting are commonly used.

The floor of rabbitry should be made of concrete while the roof should have asbestos or corrugated iron sheet. Poultry deep litter house can be used and males are kept separately from females.

### **FEEDING**

i. Rabbits are omnivores but take in little amount of vegetation.

They are fed with concentrates in pellets and supplements e.g sweet potato leaves, amaranthus, waterleaf, centro, calapo, tridax.

If there are no concentrates, poultry growers mash can be fed to rabbits. Feeds and water should be provided regularly with feeders and drinkers.

### **Hygiene**

i. Clean the floor daily.

Wash the feeders and drinkers regularly

Remove dust and cobwebs from rabbitry.

Sanitation

### **Prevention / Control Measures.**

i. Disinfect the rabbitry.

Isolation

Remove and bury dead animals.

Deworm rabbits regularly.

Provide disinfectant foot dip at the entrance.

Treatment using antibiotics.

## **ANIMAL NUTRITION**

It is the science of nourishing the animal's body with the best nutritional requirements for major body growth and development.

### **Classification of Feeds**

**Basal feeds:** They are feeds that have high proportion of easily digestible carbohydrate and they constitute to 90 percent of any livestock rations. They have low protein and fibre contents and therefore should be supplemented with high protein feeds. Examples are maize, rice, guinea corn, millet, cassava and yam.

**Concentrates (protein):** These are feeds that supply primary nutrients such as carbohydrates, proteins and fats. They have low fibre content and also low in minerals. Examples are groundnut cake, cotton seed meal, palm kernel cake and coconut meal.

**Supplements (mineral/vitamins):** These are feeds given to animals to supply deficient nutrients. They are high in vitamins and minerals but low in carbohydrates, proteins and fibre. They mostly aid in food digestion and resistance to diseases e.g groundnut cake fish meal, cotton seed cake.

**Roughages:** They are feeds with high fibre content and are low in digestibility. They can be given to animals either dry as hay, straw, seed hulls or wet as green pasture (succulent feed).

## Composition, Sources and Functions of Food Nutrients.

**Carbohydrates:** They are organic substance containing hydrogen, oxygen and carbon  
Sources of carbohydrates are cereals, tubers, hay

### Functions

- i. It produces energy for animals physical and metabolic activities.
- ii. Excess carbohydrates are stored as body fat.

**Protein:** They are organic substances that contains carbon, hydrogen, oxygen and nitrogen as well as phosphorus and Sulphur. Sources of protein are cotton, animal protein, fish, meat, beans, soyabean, breadfruits egg, milk.

### Functions

- i. Repair and replacement of worn out tissues.  
Building blocks for amino acid use for body growth.  
Synthesis of milk, enzymes and hormones.  
Development of foetus.

**Fats and oil:** They also contain hydrogen and oxygen. Sources of fat and oil are palm kernel, coconut cake and oil seeds.

### Functions

- i. Energy supply.  
Regulation of body temperature  
Supply essential fatty acids needed by the body.

**Mineral salts:** When plants and animals' tissues are burnt, ash is formed which contains minerals: examples are sodium (Na), potassium (k) phosphorus (p) calcium (ca) etc. Sources of mineral salts are fruits, vegetables, grasses milk, blood meal, salt licks, bone meal, oyster shell.

### Functions

- i. Important for development of bones and teeth in animals  
For the development of hard egg shell.  
They aid in growth and reproduction.  
Necessary for blood clotting.  
Maintenance of acid-base balance.

**Vitamins:** They are also organic compounds necessary for normal and healthy growth of animals. Sources of vitamin are vegetables, fruits, milk, butter, yeast, meat, sunlight, cereal, fish.

### Functions

- Essential in carbohydrates metabolism.  
It aids in energy transfer.

They aid in resistance to diseases.

Aids in deposition of calcium on bones, teeth and egg shell during formation.

**Water:** It contains hydrogen and oxygen. Sources of water are springs, rivers, boreholes, streams, lake, well, seas, oceans.

### **Functions**

i. It aids in turgidity of cells.

Provision of drinking water.

Used in cleaning animals pens.

Washing feeders and drinkers.

Helps in digestion and irrigation.

### **RATION**

A ration is the total amount of food taken by a farm animal per day.

#### **Types of Ration**

**Balanced Ration:** It is a feed that contains all the essential nutrients in the right amount and adequate proportions for proper livestock feeding.

**Maintenance Ration:** It is the ration used to maintain constant body weight of farm animals and carry out normal body functions or activities.

**Production ration:** It is the ration given to active producing animals for the purpose of production.

### **MALNUTRITION**

This refers to a condition in an animal when a ration is lacking one or more nutrients in adequate amounts.

#### **Causes of Malnutrition**

**Low income:** Majority of farmers are poor and cannot give their animals balanced ration.

**Food shortage** – Due to peasant farming, low food production makes food stuff scarce for formulation of adequate feeds.

Poor selection of food nutrients for feed formulation due to illiteracy of some livestock feed formulators.

**Population pressure** – High population leads to greater demand on food for human consumption thereby making food items few for producing feeds.

#### **Symptoms of Malnutrition**

i. Low resistance to diseases      ii. Low yield      iii. Stunted growth      iv. Emaciation      v. Dull and rough hair coat      vi. High mortality rate

#### **Corrections of Malnutrition**

Provide balanced ration regularly

Avoid under feeding of animals

Provide a good grass-legume pasture

Provide supplementary feeds

## **NUTRITIONAL DISORDERS**

**Ketosis** – it is a metabolic disease arising from insufficient carbohydrates and excess proteins in the ration of livestock.

Symptoms – Loss of appetite.

**Milk fever** – It is a sharp fall of calcium in the blood due to deficiency of calcium in rations.

Symptoms – i. Loss of appetite ii. Constipation iii. Nervousness

**Rickets** – This is softness of bones with swollen needs due to lack of calcium, phosphorus or vitamin D in the ration.

Symptoms – i. Soft and flexible bones ii. Soft egg shell iii. Stiff joints

**Beri-beri** – This is a carbohydrate disorder and poor enzymatic reactions due to lack of vitamin B.

Symptoms – Loss of appetite, weight loss and fatigue

**Scurvy** – Bleeding of gums due to deficiency of vitamin C in rations.

Symptoms – i. swollen and bleeding gums ii. Low resistance

6. **Fellagra** – This is amino acid disorder from vitamin B deficiency.

Symptoms – i. Shriveled skin ii. Emaciation iii. Nervous disorder

**Baby pig anaemia** is from iron deficiency.

Symptoms – i. Loss of appetite and nervousness .

**Grass tetany** – Low blood magnesium.

## **RANGELAND MANAGEMENT**

**Definition:** Range land is a piece of land which is used for the growing of forage grasses and legumes where animals live and graze.

### **Importance of Rangeland**

Rangeland provide green succulent feed for livestock during the entire grazing season.

The animals feed on the crops at a minimum cost.

Livestock kept on well managed rangelands are more comfortable and sanitary than those kept on dry lots.

The animals have access to varieties of forage thus eating balanced seed.

Dead plants materials from rangelands build up the fertility of the soil.

### **Characteristics of a Rangeland**

It contains high quality grasses and legumes.

It contains no weed except some plants for shades.

Selected grasses and legumes are grown in adequate quantity/proportion.

It is properly managed for high productivity of the forage corps e.g fertilization, irrigation etc.

### **Factors Affecting Productivity of Herbage**

**Rainfall-** rainfall is need for the continuous growth of forage crops and helps to dissolve nutrients and make them available to pasture plants.

**Fertility of the soil** – the soil must be fertile so that production can be enhanced.

**Control of weeds** – weeds should be removed from rangeland in time since they compete with herbage plants for nutrients, space and sunlight.

**Avoidance of overstocking** – the correct number of animals should be allowed to graze a specific area of pasture.

**Grazing** – rotational grazing should be adopted to provide opportunity for the grazed plants to regenerate.

### **Methods of Rangeland and Pasture Improvement**

Control stocking

Rotational grazing

Use of fertilizers

Reseeding

Introduction of legumes

Control burning.

**Control stocking** – the rate of stocking should be such that the natural quality and productivity of the rangeland are maintained.

**Use of fertilizers** – apply fertilizers such as phosphorus and nitrogenous fertilizers and lime to boost the growth of pasture.

**Control burning** – burning may be used to remove accumulation of old grass but it should never be done to stimulate new growth.

**Relational grazing** should be used to avoid overgrazing of pastures.