DISTANCE LEARNING CENTRE

ANS 210

Principles of Animal Production

University of Ibadan,
Ibadan

Ibadan Distance Learning Centre Series

ANS 210
Principles of Animal Production

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Vice-Chancellor's Message

I congratulate you on being part of the historic evolution of our Centre for External Studies into a Distance Learning Centre. The reinvigorated Centre, is building on a solid tradition of nearly twenty years of service to the Nigerian community in providing higher education to those who had hitherto been unable to benefit from it.

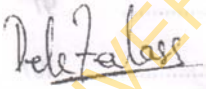
Distance Learning requires an environment in which learners themselves actively participate in constructing their own knowledge. They need to be able to access and interpret existing knowledge and in the process, become autonomous learners.

Consequently, our major goal is to provide full multi media mode of teaching/ learning in which you will use not only print but also video, audio and electronic learning materials.

To this end, we have run two intensive workshops to produce a fresh batch of course materials in order to increase substantially the number of texts available to you. The authors made great efforts to include the latest information, knowledge and skills in the different disciplines and ensure that the materials are user-friendly. It is our hope that you will put them to the best use.

We thank the John D and Catherine T MacArthur Foundation for facilitating the preparation of the materials through a substantial grant to the University.

Once again, I congratulate you and encourage you to work hard to obtain the prestigious degree of the University of Ibadan.



Professor Ayodele Falase
Vice-Chancellor

Foreword

The University of Ibadan Distance Learning Programme has a vision of providing lifelong education for Nigerian citizens who for a variety of reasons have opted for the Distance Learning mode. In this way, it aims at democratizing education by ensuring access and equity.

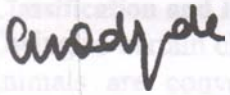
The U.I. experience in Distance Learning dates back to 1988 when the Centre for External Studies was established to cater mainly for upgrading the knowledge and skills of NCE teachers to a Bachelors degree in Education. Since then, it has gathered considerable experience in preparing and producing course materials for its programmes. The recent expansion of the programme to cover Agriculture and the need to review the existing materials have necessitated an accelerated process of course materials production. To this end, two major workshops were held in November 2002 and January 2003 which have resulted in a substantial increase in the number of course materials. The writing of the courses by a team of experts and rigorous peer review have ensured the maintenance of the University's high standards. The approach is not only to emphasize cognitive knowledge but also skills and humane values which are at the core of education, even in an ICT age.

The materials have had the input of experienced editors and illustrators who have ensured that they are accurate, current and learner friendly. They are specially written with distance learners in mind, since such people can often feel isolated from the community of learners. Adequate supplementary reading materials as well as other information sources are suggested in the course materials.

The Distance Learning Centre also envisages that regular students of tertiary institutions in Nigeria who are faced with a dearth of high quality textbooks will find these books very useful. We are therefore delighted to present these new titles to both our Distance Learning students and the University's regular students. We are confident that the books will be an invaluable resource to them.

We would like to thank all our authors, reviewers and production staff for the high quality of work.

Best wishes.



Prof Abiola Odejide
Director

LECTURE ONE

Introduction to General Principles of Livestock Production

Introduction

The basic principles of livestock production form the foundation out of which the farm animals are classified into distinctive sections, crossed, produced, reared and managed. It forms the basis from which practical animal production programme are formulated, collated, tested and well programmes recommended. Livestock are animals, which are kept on a farm for production purposes. Since such animals are aimed at because of their respective product and by–products, enhanced animal husbandry technique demands that animals are cared for in the manner that they will produce to the highest possible level with the management available.

Objective

By the end of this introductory lecture, the student should be able to state and explain the basic principles of animal husbandry.

Pre-Test

1. Name the common farm animals within your vicinity.
2. State the major systems of livestock production.
3. Define animal breeding.
4. What is judging in livestock production?

CONTENT

Classification and Importance of Livestock

Owing to certain characteristics in terms of anatomy and physiology, farm animals are conveniently grouped into simple stomach and complex stomach animals.

There are other words that could interchangeably be used such as monogastric for simple stomach and polygastric for complex stomach. When some animals have taken feed, they regurgitate and chew their curds and therefore are called ruminants. Other animals do not chew their curds and are called non- ruminants.

Prospects of Livestock

One of the most lucrative ventures and booming industries in the world today is the livestock industry. Meat, eggs and milk are valuable products for human consumption. A country that is capable of feeding her citizens would eventually save a lot of foreign exchange for other purposes. Numerous raw materials and by-products are obtained from farm animals ranging from hides and skin, wool and silk, blood, bone and feathers that could be processed for other uses. Apart from the fact that animal manure is an organic fertilizer for arable crops; it is also being recycled to feed animals. Thus, the judicious use of animal manure would drastically reduce environmental pollution. Livestock production is like an umbrella or a tree with definite branches comprising rearing, management, milking, breeding, feeding, processing and marketing. Therefore, livestock industry admits a lot of jobless people into the working class. Livestock provides drift power that enables improvement of crop production and transfer of the products from production area to the distribution center. In a nutshell, a well-planned and intelligently implemented livestock programme is a dependable source of income and foreign exchange for the individual or corporate farmers and government at large.

Terminologies

As you systematically go through this lecture material, some salient but paramount words will definitely attract your attention. It is essential to be familiar with some of them so as to flow with the lecture.

1. **Farm Animals** – not all animals are farm animals. Farm animals are six in number, which include cattle, sheep, goat, pig, rabbit and poultry.
2. **Animal Products** – These are primary materials such as meat, milk, eggs and wool obtained from livestock.
3. **Animal Production** – This is the act of growing or rearing of animal at a particular time and for a specific purpose.

4. **Animal Management**–It is the control and making of decision in livestock enterprise. Such control and decision are based on stocking rate, housing, breeding, feeding and health of the animals.
5. **Breed of Livestock**–This is defined as a population of animals, which differ from those in other population within the same species in respect of definite genetically determined traits. The traits, which characterize a breed can be qualitative e.g. hair type, hair colour, horns or quantitative such as size, body type, milk yield or fat content of the milk.
6. **Animal Breeding**–Animal breeding is the application of scientific knowledge to the genetic improvement of animals. Genetics provides the foundation principles, which should guide animal's breeding practice. Genetic principles are utilized and synthesized into breeding programmes. In our study in this course, some lectures are devoted mainly to the principles of animal breeding. You will then discover that the aims of animal breeding are broadly divided into two:
   (i) To select the most desirable animals based on the prediction of the genetic merit and
   (ii) To produce superior genotypes by the combination of genetics through breeding plans and system of mating. Livestock production is an economic enterprise, and animals breeding recommendations must be examined in the light of economic, as well as genetic consideration. The basic objective of animal breeding is to enhance the efficiency of production and the quality of the product for the ultimate consumer through planned genetic change.
7. **Inheritance or Heredity** – The study of how characteristics are passed on from one generation to the next is called heredity. The pioneer of this study was a man called Gregor Mendel. The Mendelian law and its application to livestock production shall be discussed and simplified in our subsequent lectures.
8. **Livestock Identification** – Identification of individual animals is imperative for updating livestock records, selection programmes, health programmes, breeding schedules, reproduction cycles etc. There are listless systems of livestock identification such as memory, colours, size, pictures, ear tags, tattoos, brands on the skin, brands on the horns or hoofs, flesh marks, neck bands, leg bands, nose rings etc. The method of identification to be adopted is a

question of the reason behind it and more importantly the interest of the stockman as well as the limitations posed by the livestock.

9. **Management Operation**–These are normal regular or seldom activities executed in the farm. They are scheduled routine events for the upkeep of the animals. There are certain farm operations that are 'day-to-day'. Such operation cannot be deferred. Cleaning, feeding, egg collection, exercising confined animals and grooming, are examples of such operation. Occasional or periodic operations are carried out when there is a need for it. Situation and circumstances dictate them. For example, castration is done to prevent indiscriminate mating and also putting female and castrated male together will ease the management. Other occasional management operations are dehorning, docking, removal of supernumery teats, teeth clipping, debeaking etc.
10. **Gestation Length** – This the period from when the animal is sure of being served (pregnant) to the parturition period. The length varies from one animal to the other. Gestation period for cattle, sheep, goats, rabbits and pigs are 281, 150, 150, 32, and 114 days respectively.
11. **Management Systems** – These include:
    (i) **Intensive system of management** – It is a system whereby livestock is completely confined or restrained within an area by meeting all its need in that area. It is a modern system of farming, which enhances thorough care (feeding and health), growth and reproduction.
    (ii) **Extensive system of management** – Animals are allowed to roam and scavenge for food. There is little or no care. Animals under this system are at the mercy of diseases, predators, thieves, etc.
    (iii) **Semi-intensive system** – livestock are permitted to roam freely under natural conditions to feed themselves and often supplied with supplement at a schedule time.
    (iv) **Livestock judging** – Livestock judging is the means of appraising the value of livestock for the purpose for which they are produced. Judging as it would be understood later is applicable to all domestic or farm animals.

Summary

In the just concluded lecture, we have learnt that as livestock are kept for their products, a general principle of livestock production and other management strategies should be put in place in such a manner that the animals would be able to produce optimally. Also, certain words (terminologies) to be used in the subsequent lectures have been defined as introductory.

Post-Test

1. List the prospect of livestock production in Nigeria.
2. State certain management operations for farm animals.
3. Mention various ways to identify livestock.

Reference

McNitt, J.I.(1983). *Livestock Husbandry Techniques.* (First edition) London: The English Language Book Society and Granada.

WORK SHEET

nstruction: *Use this work sheet to supply answers to the post-test questions at the end of this chapter. It should also be used to answer any assignment (practical or theory) given by your lecturer. You may use extra sheet(s) where necessary.*

Name:..... Matric no:.....

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LECTURE TWO

Animal Production and its Development

Introduction

In agriculture generally, Nigeria livestock industry represents an important asset with very great economic, social and nutritional potentialities for the country. Apart from supplying a way of livelihood to significant proportion of the rural agricultural producers, livestock sub-sector together with the fisheries sub-sector, constitute the country's main hope for bridging the aspiration gap between demand and supply of animal proteins in the average Nigerian diet. With an estimated livestock population of 17.8 million cattle, 14 million sheep, 69 million pigs and 124 million poultry, Nigerian should not have a problem of animal protein supplies.

Objective

At the end of this lecture, students should be able to categorize the farm animals with proper descriptions and trace the history of livestock and its development in Nigeria.

Pre-Test

1. List the farm animals.
2. Classify the farm animals into two.
3. Differentiate between ruminant and non-ruminant animals.
4. Give a short history of livestock production and development in Nigeria.

CONTENT

Classification of Farm Animals

Farm animals occupy significant positions in human life today due to their numerous utilities to man. Farm animals can be broadly grouped into ruminants and non-ruminants.

1. **Ruminant Animals:** As the name implies, they are the animals that depend solely on forage (ungulate), ruminate or regurgitate and chew their cuds. These animals are polygastrics, which possess complex stomach of four compartments. Such ruminant animals include cattle, goat and sheep.
2. **Non-ruminant Animals**: These are the animals that may eat little grass but solely depend on grains. They are monogastrics i.e. only one stomach. Such animals are poultry, rabbit and pigs.

Livestock Development in Africa

Livestock development between 1950 and 1970 in Africa has been analyzed; the periods were characterized by increased at an annual rate of 2.1 and 2.3% respectively in livestock production (meat and milk from all species). On a per-capita basis, meat and milk production decreased during that period. The decrease was only slight, but the level in 1950 was already significantly below the world average and was even more so in 1970. Over the 20-year period, meat and milk productivity showed minimal increase only, a decrease even for beef.

The relevance of livestock development experience between 1950 and 1970 is ambiguous. Many African countries underwent commotions in the periods preceeding and following independence, concentrate efforts at agriculture development and development aid generally did not take on large dimensions before the mid-sixties.

The History of Livestock Production in Nigeria

Prior to the period of British colonialism in Nigeria, animal management and production was on a small scale and at subsistence level. The subsistence or traditional livestock producers depended solely on nature to bring about a minimal level of productivity with domestic animals.

However, with the advent of the British colonialism, it was paramount to retard the incessant outbreak of diseases. Good enough, some of the colonial masters were veterinarians and the purpose of the colonial rule at that time was meant to reduce high mortality in the traditional livestock species.

Such policy continued until independence in 1960.The earlier Institute concerned with livestock production was the Veterinary that deals with livestock diseases. The first one was West African Institute for Trypanosomiasis Research (WAITR) which later metamorphosized to become Nigeria Institute of Trypanosomiasis Research (NITR). This Institute was charged with the control and to reduce the outbreak and nature of trypanosomiasis. It was further charged with the responsibility of production of vaccines for the prevention of many diseases of livestock such as rinderpest, anthrax, *Hemorrhagic septicaemia*, brucellosis fowl pox, Newcastle, fowl cholera etc.

The above policy of the government was favorable in the course of time to individual farmers and livestock industries. Therefore, after independence, colonial masters put forward the idea of National Production Research Institute (NAPRI) based in Shika, Zaria.

Demand for Livestock Foods

Nigeria is today confronted with the problem of uncontrolled population growth, rapid urbanization and widening gap between demands for and supplies of food for her teaming population. It is expected that the rapidly growing population coupled with increasing urbanization rates and increase in personal income of urban dwellers will fuel an increase in demand for food, most especially those of animal origin.

Despite the fact that agriculture remains Nigeria's leading non-petroleum employing more than 60% of the country's active population, it is currently unable to meet the food demand and needs of the country. Indeed there is already a widening gap between demand and supply of foods of animal origin which, has resulted in a steady decline of the per-capita supplies and dietary animal protein intake of a vast majority in the past two to three decades. It was estimated at approximately 8.6g in 1968 but declined to about 6.5g in 1980 and about 6.0g in 1992. These figures are far from the recommended minimum requirement of about 34g of a total daily protein intake and maximum of 85.9g.

The low levels of animals' protein supplies have generally been blamed, at least in part, on the fact that the agricultural economy has generally emphasized crops rather than livestock production and management.

Priority for Livestock in National Development

Given its strategic role in accelerating national economic growth, the livestock sector deserves a position of greater prominence in national development. A review of successive National Development Plans since independence in 1960 shows that whereas other sectors have continued to receive substantial allocation, Agriculture has always been given less. And within Agriculture, the livestock sub-sector has always received the smallest allocation. For example in the second National Development Plan (1970 – 1974), out of a total planned expenditure of ₦2.05 billion, Agriculture received only ₦265.3 million and out of this, livestock receive only ₦23.3 million of the overall allocation.

In the third National Development Plan, Agriculture was allocated ₦2.2 billion of planned expenses while livestock received ₦344 million of the sectoral allocation to Agriculture and a mere 1.05% of the total planned expenditure for the 1975 – 80 plan.

Thus, over the years livestock has been given very little attention in spite of its recognized role and importance in the nutrition of Nigerians. Given the ever – widening gap between the demand and supply of livestock products and the worsening dietary calories: protein malnutrition, there is an urgent need for government to reorder its priorities and accord the livestock industry what will be required to meet the need of Nigerians between now and the first quarter of the 21st Century.

Summary

So far in this lecture, the basic farm animals, cattle, sheep, goat, poultry, rabbit and pigs are classified into ruminants and non-ruminants. The production and management of these animals had been subsistently practised before the advent of the British colonial master, whose arrival abrogated the incessant outbreak of livestock diseases. Such policy progressed until the Nigerian independence in 1960, after which certain institutes for livestock researches emanated. The demand for livestock foods is becoming higher but this is associated with little attention to boost production on the side of the government. This increased attention to animal production is of course imperative in order to meet up with the recommended minimum FAO requirement of about 34g of a total daily protein intake of 85.9g.

Post – Test

1. State the farm animals and classify them into two.
2. Differentiate between ruminant and non – ruminant animals.
3. Highlight the history of livestock production and development in Nigeria.

References

Tewe, O.O.; Iyayi E.A.; Oluyemi J.A; Adewunmi M.K. and Abu O.A. (1999). *Animal Science at the University of Ibadan: The way forward.* 25th Anniversary Commemorative Brochure. Ibadan: De-Ayo Publications,.

Jahuke, H. E. (1982). *Livestock Production Systems and Livestock Development in Tropical Africa*. Kieler Wissenschaftsverlag Vauk.

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LECTURE THREE

Prospects of Animal Production in Nigeria

Introduction

Livestock plays many vital roles in the Nigerian economy. Apart from accounting for a fairly substantial part of the Gross National Product and directly employing a large proportion of the population, livestock provide food for consumption and means of conveyance of products to the market. The hides, skins and fibres provide the raw materials for a variety of household products. Sales of livestock and their products raise cash for their owners for the procurement of other farm inputs such as fertilizers and seeds for crop production, drugs for animal health care and cash for payment of school fees and other financial obligations.

Objective

At the end of this lecture, students should be able to identify and explain the prospects of animal production in Nigeria.

Pre-Test

1. State the importance of the following in animal production:
   - (a) Foods
   - (b) Materials
   - (c) Manure
   - (d) Work
   - (e) Employment
   - (f) Income
   - (g) Foreign exchange
   - (h) Rural development
   - (i) Pets and exhibitions

CONTENT

Food

The essential and valuable products of livestock are meat, milk and eggs and their derivatives. Consideration of the protein value is one way of accounting for the particular nutritional quality of livestock foods. A nation that can feed her population can save a lot of money for other goods and services that are not provided through livestock industry. Through the provision of food, importation of such food items like milk, egg and dressed carcass is prohibited, thus ruled out bankruptcy of the nation. As a result of self-sufficiency in the provision of animal protein to feed the teeming population, debt burden on the nation is also avoided

Provision of Raw Materials

Milk is obtained from ruminant animals precisely cattle and this is being used by the dairy and cheese industry. Certain animals provide hides and skin for clothing, shoes, bags, belts, straps, and caps. Wool and silk are being provided by sheep for clothing. The eggs from poultry can be used for pomade and biscuits. Blood, bone and feathers can be incorporated into animal feed as a source of protein and minerals. The buttons and combs are made of hoof and horns.

Manure

The value of livestock dung and droppings for soil fertility is widely recognized and accepted by most tropical farmers. Also, some livestock farmers are presently adopting the recycling of animal manures to feed their animals. In other parts of the world, poultry droppings are used to generate maggot and earthworm as a source of proteins for poultry birds and fish respectively. In addition, manure is used for fuel and as a building material. Developing and maintaining technology for this will invariably ameliorate the air pollution in the society.

Employment Opportunities

Livestock industry admits many people into the working class. This is made possible as a result of several branches embedded in the industry that ranges from rearing, managing, milking, breeding, feeding, processing and marketing. If livestock farming is allowed and encouraged to develop into a commercial status, it will ensure capability of those employed under it to produce animal food to feed the country and simultaneously paving way for exporting. Personnel are required in pasture and range

management to cultivate the land, plough it, plant the grass, manage it and cut it for the feeding of ruminant animals. There is also specialization at abattoir where people are specifically involved with the processing of bone and blood into meals.

Source of Foreign Exchange

A nation, Nigeria in particular can earn foreign exchange through the export of livestock product like hides and skin, milk and meat products. The tanning industry, especially in Japan, has continuously been ordering for the supply of hides and skin from Nigeria. The foreign exchange so earned can be utilized in turn to acquire other commodities vital for improvement of the livestock industry back at home in Nigeria. However, the development of livestock products and even livestock will eventually reduce dependence on the crude oil market, which may be unreliable due to its fluctuations.

Income for Farmers

The sales of eggs, day-old chicks, kids, lambs, calves, milk, meat and other by-products from livestock generate stable income for the farmers. Wages and salaries of livestock workers are well provided for through the income so generated.

Farm Animal Power

This is the type of power derived from some animals to perform certain farm operations and activities. Livestock like the male cattle (bull) is commonly used in certain parts of the world for pulling implements such as ploughs, harrows, planters, ridges and possibly sprayers. Other animals like donkeys, horses and camels are used for transportation of farm produce over a long distance. Such animals are capable of performing more tedious jobs than man and can handle numerous farm operations. The initial purchase of these animals is cheap, relative to cost of machines. The animals do not get fatigued easily compared to man.

Development of Rural Areas

There is a rapid development of towns and villages where livestock industries exist, as social amenities like electricity and pipe borne water will be provided. In addition, good and motorable roads are provided. Other allied industries may also be established in such places.

Pets and Agricultural Exhibitions

Certain animals are cherished by individuals and corporate bodies and such animals are kept as pets. Other strain of animals due to their genetic improvement is specially reared for livestock shows and advertisement. Most of the time, such special animals are preserved to be presented as a gift for birthday and as incentives to government functionaries. In certain parts of Nigeria, good-looking animals are presented for dowry during engagement and marriages.

Summary

A developing nation must have a developed livestock industry as a source of animal protein, raw materials for the existence of allied industries. Manure for enrichment of the soil, animal power as a cheap source of farm power, employment for the teeming population, income and profit for the owners, foreign exchange for less dependence on crude oil market, rural development in road, electricity, hospitals and schools and pets for exhibitions or special occasions.

Post-Test

List and explain the importance of livestock to Nigerian economy.

Reference

Jahuke, H.E. (1982). *Livestock Production System and Livestock Development in Tropical Africa*. Kieler Wissenschaftsverlag Vauk.

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LECTURE FOUR

Problems of Livestock Production in Nigeria

Introduction

The expected animal products turn out that will match with the ever-increasing population is yet to be achieved. Nigeria is blessed with high potential animals that are capable of supplying the necessary animal protein for the citizens. These animals have however, been hampered by colossus of problems that ranges from biological, socio-economic to institutional factors. Animal scientists, private organizations and federal government should awake to revamp the collapsing livestock section of the agricultural sector.

Objective

At the end of this lecture, students should be able to state and explain some biological and technical constraints to livestock production in Nigeria.

Pre-Test

1. List and discuss the biological factors that may contribute to the low productivity of livestock.
2. State and highlight the main technical, socio-economic and institutional factors that affect animal production in Nigeria.

CONTENT

A. Biological/Technical Factors

Among the essential biological factors are feeds and nutrition, breeding stock, diseases and animal health care, management, water supplies, electricity, capital, storage and processing.

Feeds and Nutrition–Feed supplies that could adequately meet the animals' requirements in terms of quantity as well as quality are inadequate and often at times unavailable. This however, is resulting in a low state of nutrition and performance well below the potential of improved stock.

Improved Breeding Stock – There is a general scarcity of improved breeding stock, although thinly available in commercial farms. The highly productive stock, in a few farms is very little well maintained. To a great extent, most producers rely on imported stock of day-old chicks, and the production of weaner pigs is still generally low.

Diseases and Animal Health Care – One of the outstanding problems to animal production in Nigeria is the poor animal health care emanating from insufficient disease control and health care management. Despite the technological advances in animal health and care, epidemic diseases of livestock remain widespread. Trypanosomiasis continues to render otherwise productive land unavailable to cattle production. Several other diseases which may adversely affect production, and for which control measures have been worked out continue to ravage our livestock because of inadequate or poor veterinary services. Pests and diseases reduce the yields that often discourage the farmers from production.

Management–The comparative scarcity of well-trained professionals and technical manpower to operate livestock enterprises has resulted in the poor performance of many commercial livestock projects. In fact, the trend has been for poultry, piggery and rabbitary operations to employ cheap untrained attendants, resulting in ineffective, mismanagement and unprofitable operations.

Water Supplies-The problem of water supplies is a two-edged sword, one facing the food production and the other directly facing the animals. The epileptic rainfall pattern have adversely affected water supplies for both crop and livestock operations. Many animal establishments are unavoidably sited from good and abundant water source.

Electricity-Power failure or a continuous erratic supply of electricity jeopardizes animal industries. Some equipment are automated, while a lot of operations depend largely on electricity such as incubation, hatching, brooding and rearing.

B. Socio-Economic and Institutional

The inclusion of these are marketing and infrastructures, land tenure system, credit facilities, inadequate research support, government policies, trained manpower and storage and processing facilities.

1. **Marketing and Infrastructure-Market** and infrastructure are constraints that evolve consequently to the insufficient provisions for planned production. Lack of good roads to facilitate quick transportation of livestock products to consumers, inadequate electricity, portable water for processing (milk, incubation, brooding etc.) and preservation (dairy and meat products), have often discouraged milk production and collection schemes and the distribution of the available domestic supplies.
2. **Land Tenure System-** Land tenure is a system of land ownership either by an individual family, community or government agency, either for temporary or permanent use. Under this stringent system, acquisition of permanent livestock structure and rangeland for animals are practically impossible. Land tenure systems posed problems, which often discourage potential investors from committing their funds to long-term improvements due to uncertainties over land ownership.
3. **Credit Facilities-** Livestock owners have been faced with the little or no credit facilities to cover the comparatively high costs of establishing livestock projects. The problem is compounded due to inability of the farmers to have the expected collateral security to enable them secure loan from banks. High interest rates/charged by banks prevents borrowing by farmers.
4. **Inadequate Research Support-** In advanced and industrialized countries, the developed and high level productivity of the livestock has been achieved through public and private sector investments in research and development. In this part of the world, such investments in research and development would be required to facilitate a better understanding, analysis and the development of appropriate solutions to the problems of the existing livestock industry.
5. **Trained Manpower-**There are inadequacies of range and pasture management specialists, agrostologists, veterinarians, animal scientists, artificial insemination technicians and livestock extension workers. There is a dearth of technicians with the technical know-how appropriate to smallholder production and the managerial

capacity to run such operations. There is also a scarcity of qualified and experienced manpower to conduct problem–solving research, analyze policies and implement development.

6. **Government Policy on Agriculture**: Inconsistent government policies on livestock reduces the animal development. Sometimes, these policies failed to recognize the peasant farmers that produced food for the country. Most of the livestock programmes are centered on fake city livestock owners who merely collect money and use them for other non-agricultural purposes. Poorly formulated policies on commodity pricing, subsidies, and products imports have often been a disincentive to the local livestock industry.
7. **Lack of Storage and Processing Facilities-** Lots of produce are wasted due to lack of storage and processing facilities. Improper storage reduces the quantity and quality of meat, egg and milk. Where such storage and processing facilities are available, they are very expensive to purchase and maintain. On certain occasions, there is lack of technical know-how for food storage and processing. The aftermath effect of this is that farmers are forced to produce just enough for themselves and their families.
8. **Inadequate Farm Inputs-** Farm inputs like chemical fertilizers, tools and implements for cultivation of forage and other crops for livestock are grossly inferior in quality and also expensive. Farm inputs even when they are available are not supplied to the farmers at the right time.
9. **Inadequate Agricultural Education and Extension: -** Majority of the animal farmers are illiterate and ignorant of the technicalities of the modern farm inputs like animal feeds and feeding. These farmers find it difficult to accept new innovations in livestock system that could improve their efficiency and productivity. Extension officers are very few to mediate between the researchers and the farmers.

Summary

This lecture has made you realize that the livestock development has been crippled and battered by a number of factors. Those factors were highlighted under two major factors-Biological/Technical and Socio-Economic and Institutional factors. The fact remains that the climate and the weather at large favour our indigenous animals to thrive well, but as long as those militating problems are existing, the livestock industry in Nigeria and Africa as a whole will hardly grow to meet the animal protein needs of increasing population.

Post-Test

1. List the biological factors that may contribute to the low productivity of livestock in Nigeria.
2. State and highlight the main technical, socio-economic and institutional factors that affect animal production in Nigeria.

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Tewe, O.O.; Iyayi, E.A.; Oluyemi, J.A; Adewumi M.K.; and Abu O.A (1999). *Animal Science at the University of Ibadan: The way forward.* 25th Anniversary Commemorative Brochure. Ibadan: De-Ayo publications.

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WORK SHEET

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LECTURE FIVE

Overcoming the Constraints to Livestock Production

Introduction

In the last lecture you were made to understand certain constraints to sustainable animal production and management in this part of the world. These earlier mentioned problems created difficult situations in which livestock products are becoming unaffordable in terms of cost in relation to current income levels. To achieve the expected goal in the livestock industry, frantic efforts should be made to overcome the negative circumstances around it. It may not be practicable however to solve all the problems at once, the most attention demanding constraints should be sorted out and tackled for an immediate permanent solutions.

Objective

At the end of this lecture, students should be able to identify the problems of livestock industry and then provide possible solutions to each of the problems.

Pre–Test

1. List the major problems affecting livestock industry in Nigeria.
2. State practicable solutions to each of the listed problems.

CONTENT

Land Tenure

The land use decree of 1978 in which all land in Nigeria belongs to the government, government having powers to allocate the land for use and that the livestock farmers could be allocated at least 5,000 hectares for

grazing purposes should be fully implemented. Fertilizers and manure should be used to increase production of forage crops in the available lands.

Transportation Network

All tiers of government should construct more roads and rails in the rural areas, to link urban centers and states. If possible numerous vehicles or motor vehicles should be provided to ease meat, egg and other animal's products evacuation to the market. This will however reduce the cost of transportation and consequently decrease the cost of purchasing such livestock products. Roads should be rehabilitated from time to time.

Credit Facilities

Farmers should form co-operative societies for easy procurement of loan from commercial banks. Agricultural bank like Nigerian Agricultural and Cooperative Bank (NACB) should make loan available to livestock farmers. In the same vein, banks should reduce their high interest rates to encourage borrowing. Administrative bottlenecks should be eliminated and allow direct access to the banks. Also collateral security should be in form of guarantee rather than in material forms like land and buildings.

Provision of Basic Amenities

Normal power voltage and constant electricity should be provided not only to the rural areas but also where livestock farmers are. There should be provision of portable and drinkable water for the use of both the farmers and livestock. Such water must be available throughout the year the farmers on the other hand with the assistance of the government or non-governmental organization could sink well or borehole that can serve many livestock farmers at a time.

Adequate Farm Inputs

Farm inputs such as chemicals (for disinfections, dipping, washing), tools (Candler, castrator, brooders) and implement e.g. plough and ridger for forage crop cultivation should be available at adequate quantities to farmers. Government should subsidize the cost of certain imported input and to be supplied at the right time. However local sourcing of these inputs should be encouraged.

Provision of Storage and Processing Facilities

Storage and processing facilities are to be provided by the government at subsidized rate and be placed strategically at the production areas. More people should be trained on the technology of food storage and food processing. This will of course prevent wastage and enhance maximum profit. To encourage the producers for continuous production of livestock, government should buy excess produce and store for future consumption for the entire populace.

Control of the Marketing System

Government should be purchasing excess produce from the farmers and always stabilize the prices of farm produce in the country. The activities of middlemen who buy livestock and their products at cheaper rate and sell at higher prices should be checked.

Agriculture Education and Extension

Mass literacy Campaign should be established and the present one needs to be intensified. A classical example of this is the nomadic education in the Northern and adult education in the Southern Nigeria. Rural and urban livestock owners should be given a consistent training on the significance and usage of modern systems of livestock farming. Adequate and qualified extension officers are to be employed to teach peasant farmers new innovations in livestock farming.

Control of Pests and Diseases

Chemicals, pesticides and medicines used in the control of pests and diseases should be available and cheap. This should be geared towards functional control of pests and diseases. Certain vaccines to prevent occurrence of viral disease such as rinderpest should be freely administered or be highly subsidized by the government. Farmers should further be trained on easy identification, prevention and control of pest and diseases.

Implementation of Government Policy on Agriculture

Dynamic agricultural policy on importation of live animals, eggs and other livestock inputs should be formulated and implemented. The policies should recognize the livestock professionals, true and genuine farmers and make provision for their assistance.

Sufficient Research Support

To overcome livestock production constraints, government would have to invest in research. Research has enhanced productivity by finding solutions to bio–technical bottlenecks. Biotechnology is providing opportunities to overcome constraints and although some of the available technology may not be directly applicable to our environment, they can be adapted (through research) to serve the local problems situations. The development of appropriate feeding system under different agro-ecological conditions, the development of health packages including the increasing prospects of tick control through vaccination are all exciting out puts of investment in research.

Adequate Tools and Machinery

Government should subsidize the cost of farm machines such as automated feeder, incubator and hatcher, milking machine, feed miller, dressing machine debeaker, fodder harvester e.t.c. Indigenous fabrications of tools and implements should be encouraged. Agricultural engineering schools on fabrication and maintenance of such tools and machines should be set up to train personnel. There is an urgent need to provide adequate facilities for the universities to train the required manpower for our livestock industry.

Recognition of Livestock Industry

One would like to reiterate that given the present trends in production, it is expedient to assume that small livestock holder producers will persistently dominate the livestock industry. Government can take advantage of this by recognizing the industry as an instrument for social and economic development. It will be essential to establish a marketing and organizational structure based on the small producers interests i.e. run by co-operatives that will organize all aspects of the production, processing and marketing of livestock products.

Summary

The possible solutions suggested to the problems of livestock industry in Nigeria and elsewhere are not exhaustive. For once the appropriate policies have been identified and founded on these critical limitations as land tenure, finance and credit facilities, storage and processing pricing and marketing amenities and research, the livestock farmers will be encouraged and then stimulated to invest more on sustainable increase in the livestock industry.

Post-Test

1. List the major problems affecting livestock industries in Nigeria.
2. State the practicable solutions to each of the identified constraints to livestock production in Nigeria.

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LECTURE SIX

Description of Breeds of Livestock

Introduction

The primary purpose of raising livestock is the production of meat (beef, pork, mutton etc), milk (from ruminants), lard (from pigs) and eggs (from poultry). Secondary considerations are the production of skin, bristles, offal, manure etc. The prospective livestock raiser should first decide on the purpose for which animals will be raised and then select a breed that will be best suited to this and one that will also satisfy his/her preferences.

It is important to note that good and poor animals are found in all breeds, and differences in productivity between the good and inferior within a breed is much greater than the average difference between breeds. There is no one breed of a livestock species that is best for all purpose, but there are many with different characteristics that should guide a producer in making a selection or selections.

Choosing a breed is based on preference and a very good reason for selecting a particular breed is having an enthusiasm for it, for one is likely to give that breed more attention and better care than he would any other. Also, there is an advantage in working with a breed, which is common in one's neighborhood because of the ease with which breeding stock can be purchased, sold and exchanged.

Irrespective of the breed chosen, the individual animals selected should carry all the distinguishing features of the breed to which they belong. It is important to go for strains that are noted for their vigor, prolificacy and soundness.

This topic will be discussed in two parts. The first part which is contained in this chapter will touch on the breeds of poultry, pigs and rabbits, which are livestock classified as monogastrics. The second part

(contained in the next chapter) will touch on the breeds of cattle, sheep and goats, which are livestock classified as ruminants.

Objectives

By the end of the lecture, students should be able to :

1. Describe the different breeds of poultry, pigs and rabbits.
2. Identify exotic breeds that can be used to up-grade local (indigenous) stock.

Pre-Test

1. Explain the following terms: Species, Breeds, Strains and Hybrids.
2. Give the distinguishing features of the following breeding terms: Pure breeding, In- breeding, Cross-breeding
3. List four breeds, each of chicken, pigs and rabbits that you are familiar with.

CONTENT

Breeds of Poultry

Man raises several species, breeds and strains of poultry for their products. Examples of these poultry species are chicken, turkey, duck, guinea fowl, goose, ostrich and quail. Of these, chicken and turkey have assumed worldwide importance, and some of the domesticated breeds of these two species will be briefly discussed.

Breeds are considered to be a group of related species that breed true for certain characters, that breeders agree as those that distinguish the breed from others. The specific breeding of poultry in the past brought out the development of many different breeds which were characteristics of certain areas where they were developed. However, with the intensification of the poultry, traditional breeds have lost their commercial importance, and cross breeding and strain crossing have been used to produce the modern chicken and turkey.

Domestic Chickens (*Gallous domesticus*)

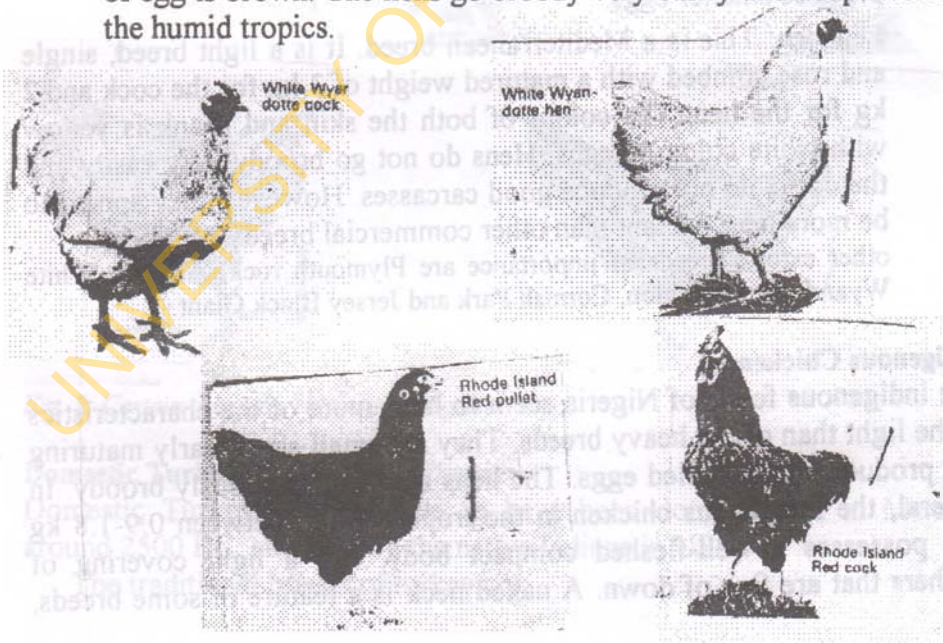
Domestic chicken is believed to have originated from Asia around 2500B.C. The domestic chicken most closely resembles the red jungle chicken (*Gallous gallous*). Not withstanding, the remaining wild species: *Gallous lafayettei*; *Gallous sonnerati* and *Gallous varius* have contributed some traits through interbreeding with *Gallous gallous*. The majority of breeds used by commercial poultry keepers are hybrids. These have been bred by the large – scale international poultry breeding corporation mostly in the developed economies. The domestic chickens are exploited

presently by man in two ways, for egg production and for meat production. Previously dual – purpose breeds were commonly used for both purposes.

High egg producing breeds are mainly of Mediterranean origin and most popular of them are Leghorn, Ancona and Minorcan. The white leghorn is probably the most widely used light breed. Examples of meat producing types are Orpington, Cornish Dark and Jersey Black Giant. These are also referred to as heavy breeds. The dual–purpose breeds such as the Rhode Island Red, Light Sussex and New Hampshire Red are the most popular breeds used in tropical countries. It is important to note that whereas the dual purpose breeds are regarded as inefficient producers of both eggs and meat by developed economies, they can be very useful especially in less intensive systems of production that is predominant in developing economies.

Examples of traditional (exotic) breeds of chicken are:

1. **Plymouth Rock**: This is an American breed, single combed with brown – coloured eggs. The colour of both the skin and shank is yellow. The matured cock can weigh 4.5 kg while the hen can weigh 3.5kg.
2. **Rhode Island Red**: This is also an American breed. Single or rose combed with a matured weight of 4kg for cocks and 3kg for hens. The colour of both the skin and shank is yellow, while the colour of egg is brown. The hens go-broody very easily and adapt well in the humid tropics.



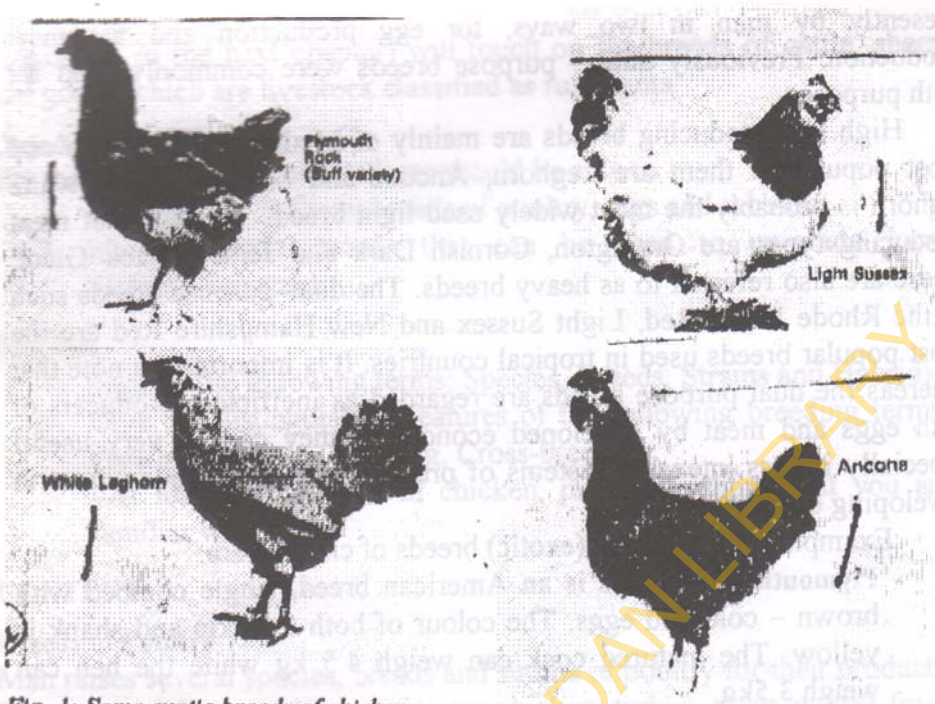


Fig. 1: Some exotic breeds of chicken

3. **Sussex**: This is an English breed, single combed with a matured weight of 4kg for the cock and 3kg for the hen. Colour of skin and shank is white with brown coloured eggs. Hens are hardy, but produce smaller eggs.

4. **Leghorn**: This is a Mediterranean breed. It is a light breed, single and rose combed with a matured weight of 3 kg for the cock and 2 kg for the hen. The colour of both the skin and shank is yellow with white coloured eggs. Hens do not go broody very easily and the cocks do not produce good carcasses. However, they appear to be more heat tolerant than other commercial breeds.

other extotic breeds of importance are Plymouth rock, Ancona, White Wyandotte, Orpington, Cornish Park and Jersey Black Giant.

Indigenous Chickens

The indigenous fowls of Nigeria seem to have more of the characteristics of the light than of the heavy breeds. They are small sized, early maturing and produce white-shelled eggs. The hens are also notoriously broody. In general, the indigenous chicken in the tropics weigh between 0.9-1.8 kg and possesses a well-fleshed compact body, and a light covering of feathers that are free of down. A naked neck is a feature of some breeds,

while some possess naked or nearly naked thighs. Birds with frizzle feathers and long–legs (especially in the hotter part of the country) are also found. They possess varied feather colouring, but for majority it is a lighter or darker shade of brown mixed with red or gold. A black colour is also fairly common. The male characteristics in cocks are well marked with the females usually possessing small heads. The hens lay about three clutches of twelve to eighteen eggs annually with an average weight of 28g.

Fig. 2: Certain domestic chickens in Nigeria

Domestic Turkeys {*Meleagris gallopavo*}

Domestic Turkeys are believed to have been domesticated in Mexico around 2500 BC, and later by the native indians in USA.

The traditional breeds of turkey are:

(i) **Mammoth Bronze**- these are large size birds with stags weighing up to 20kg and hens up to 18 kg. They have narrow Breast and low egg production per annum (about fifty)

(ii) **Norfolk Black** – These are medium-sized birds with stags weighing 7-8 kg. They have good meat conformation and egg production per annum is about ninety. However the presence of black quills on the skin is a disadvantage.

(iii) **Modern White Turkeys** – These birds were selected for rapid growth rate and light lean content. They are mostly bred by artificial insemination because they are unable to mate naturally because of their heavy weight.

Fig. 3: Example of domestic turkeys

Breeds of Pigs

Indigenous Breeds of Pigs

Small-scale pig farmers commonly rear the indigenous breeds under an extensive system of management. They are usually modest in size with adults reaching 100kg maximum and rarely weigh more than 60kg at one year of age under the best condition of management. In general, the indigenous breeds have small body size and shorter legs than exotic type with typical unimproved conformation of a large head, well developed forequarters and relatively light hindquarters. They are early maturing sexually and females show first oestrus as early as three months of age. The skin is often black, brown or occasionally spotted but rarely white. The coat is variable, usually consisting of long and thick hairs with a ridge of longer bristles along the back.

The growth rate and food conversion efficiency of indigenous pigs are low when compared to exotic breeds. However, the local breeds of pigs

have important characteristics contributing to their adaptability. Generally, they are adapted to the traditional rearing system in which food consists of diverse vegetables, waste products and unconventional feedstuffs. Indigenous sows show excellent mothering ability, which results in low piglet mortality.

Exotic Breeds of Pigs

Large White

The large white has its origin in England. It is both a bacon and pork type. It is a white coloured, long bodied, smooth and strong framed pig. It has erect ears. It is highly prolific and has good mothering ability. It adapts well to confinement conditions. It exhibits high feed conversion efficiency (FCE) and is fast growing. These qualities have encouraged its use in the breeding programmes in the tropics. However, it is susceptible to sunburn.

Land Race

The Land Race has its origin in Demark and is raised in a number of tropical countries. It is both a bacon and pork type. It is a long, all white pig with floppy ears. Its litter size, mothering ability and confinement adaptability are excellent. It is fast growing and sturdy. It is noted for its smoothness and length of body and a carcass that contain a high proportion of lean. The breed is highly favoured for cross breeding purposes. However, certain strains exhibit weakness of the limbs (leading to lameness) and are also susceptible to sunburn. Carcass quality deteriorates when fed high energy diet and it does not readily adjust to the consumption of local feed.

Duroc

The duroc has its origin in the United State of America. It is originally a lard type breed noted for its feed capacity and fertility. However, the present day duroc has been transformed by selective breeding from lard to a pork type breed. It is characterized by solid red colours that range from golden to deep brick. It has a good muscle quality and probably has the lowest incidence of stress mortality. It also exhibits good mothering ability and its litter size is average. The carcass possesses only an average back fat thickness and dressing percentage. Its most desirable traits are ability to adapt to varied conditions of the environment, sturdiness and high feed conversion efficiency. It is valuable for cross breeding purposes in the tropics. However, it exhibits problems of weak forequarters.

Hampshire

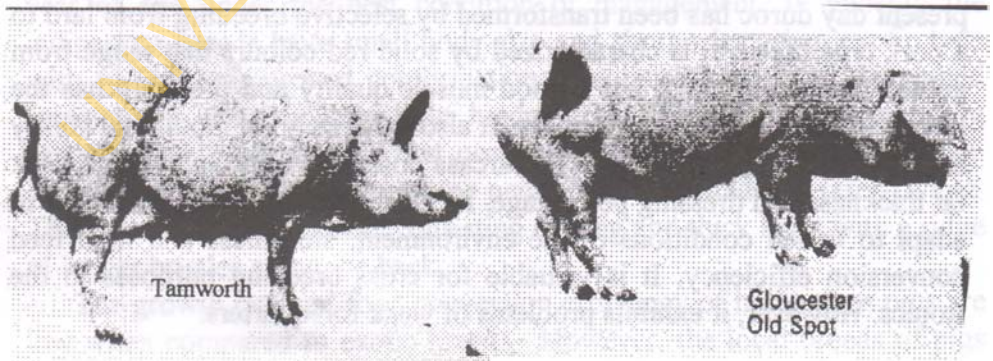
The Hampshire has its origin in England. It is a bacon type breed. The Hampshire is black coloured with a white belt around the forequarters of the body. It has a long, straight face and erect ears. The breed are medium size, prolific and good nursing mothers. They have a high proportion of lean and have a superior feed conversion efficiency relative to other breeds. Growth rate is average and they have reputation of utilizing pasture well. They possess above average milking ability. The breed is meaty and well–muscled. Sires are excellent for use in a final cross breeding programme, especially where carcass leanness is important. However, hampshire shows poor cleanliness characteristics under confinement conditions and some strains exhibit stress adaptability problems.

Berkshire

The Berkshire has its origin in England. It is a pork–type breed. It is of medium size, somewhat longer in proportion to depth than other pigs and has short legs. Coat coloured is black with six white points, i.e. white on feet, nose and tail. A white spot or two on the body is not unusual. It has erect ears, nose and a dished face. It has a meaty carcass that contains less lard relative to other breeds. Berkshire is a good grazer, grows rapidly, but not particularly large at maturity. It has proved very hardy in the tropics, and crosses well with indigenous stock. However, it exhibits average and sometimes below average fertility.

Meishan

The Meishan has its origin in lower Chanjiang River Basin in China. It is a type of Tahoe pigs that are noted for their early sexual maturity and high prolificacy. It possesses 8-9 pairs of teats with average litter size of 12 for the first farrowing and 15 for subsequent ones. A litter of 20 is not uncommon. The Meishan breeds are black, coloured with white feet. It is docile, leading and mixing. It has a short weaning period to serve as recovery interval and thereafter conceives readily to give a high-farrowing rate. It also possesses good cross fostering ability and a reduction in back fat. However the breed is yet to be introduced into Nigeria despite its various attributes and potentials in upgrading of our indigenous breeds.



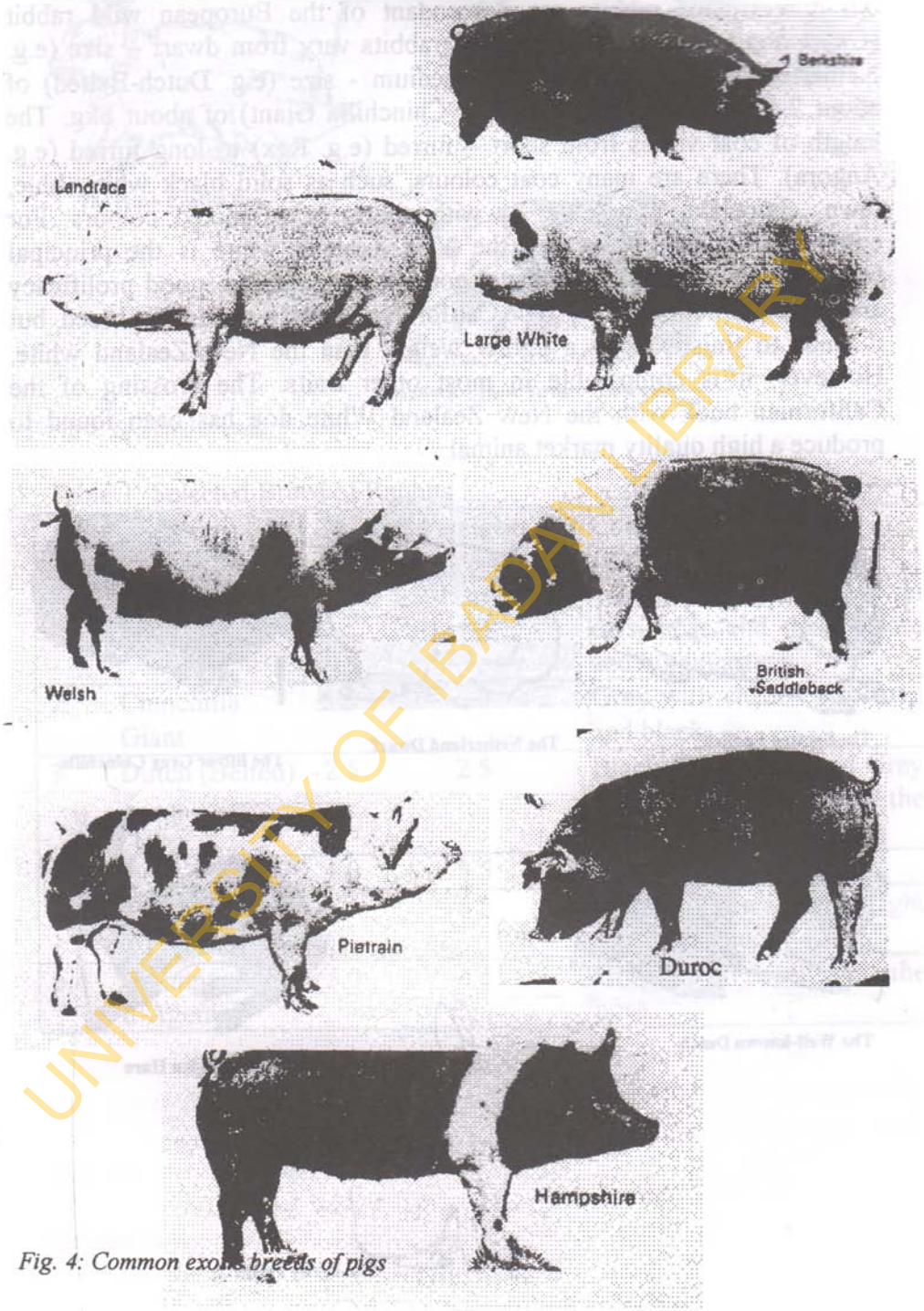
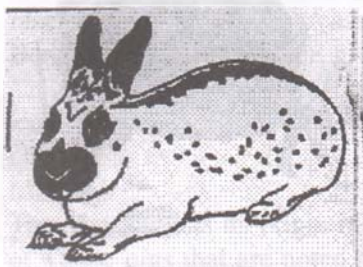


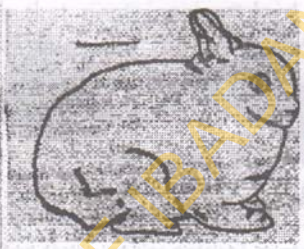
Fig. 4: Common exotic breeds of pigs

Breeds of Rabbits

All domestic of rabbits are descendant of the European wild rabbit (*Oryctolagus Cuniculus*). Breeds of rabbits vary from dwarf – size (e.g. Netherland dwarf) of about 1kg, medium - size (e.g. Dutch-Belted) of about 2.5kg, to the large-size (e.g. Chinchilla Giant) of about 6kg. The length of coat varies from short – furred (e.g. Rex) to long furred (e.g. Angora). There are many coat colours, such as solid black white, blue, fawn, chocolate, gray e.t.c, or with sports or of mixed colours. For commercial meat production, the New Zealand white is the principal breed. It has a rapid growth rate, good carcass quality, good prolificacy and good mothering ability. The Californian is also a good meat breed, but it tends to finish out at a lighter weight than the New Zealand white. However, it is comparable in most other traits. The crossing of the Californian buck with the New Zealand White doe has been found to produce a high quality market animal.



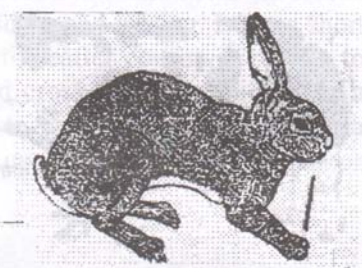
The Spotted English



The Netherland Dwarf

The Silver Grey Chinchilla

The Well-known Dutch



The Racy Belgian Hare

The Perky Polish

The Plush Coated Rex

The Californian

The Black Yellow Striped Harlequin

Fig 5: Selected breeds of rabbi

Table 1: Selected Breed of Rabbits

	Breed	Matured weights (kg)		Coat Colour
1.	Califonian	Does 4.5	Bucks 4.0	White with black colour on ears, nose and tips of fore and hindquarters.
2.	Chinchilla Giant	5.0 - 7.0	4.0 - 6.0	Grey with shades of brown and black.
3.	Dutch (Belted)	2.5	2.5	Black, Chocolate, and Grey with a white belt around the neck thoracic region.
4.	New Zealand	5.0	5.5	White, Black and Red.
5.	Flemish Giant	6.5	5.5	Black, White, Fawn, Light Grey and Sandy.
6.	Champagne d'Agent	5.0	4.5	Grey with black on the nose.

Summary

Although there is no one breed of a livestock species that is best suited for all purposes, there are many with such different characteristics that should guide a producer in making selections. For poultry, the intensification of their production has led to the traditional breeds (Plymouth Rock, Rhode Island Red, Sussex etc) loosing their commercial importance. Cross breeding and strain crossing have been employed to produce the modern chicken. The indigenous breeds of pigs are usually modest in size and of shorter legs than exotic types. The growth rate and feed conversion efficiency of indigenous breeds are also low when compared to exotic breeds (Large White, Land Race, Duroc etc). The breed of rabbits commonly raised in Nigeria is descendants of the European wild rabbit (*Oryctolagus cuniculus*). For commercial meat production the New Zealand White and the Californian are the principal breeds.

Post –Test

1. Describe the characteristics of four exotic breeds of chicken.
2. List the merits and demerits of the indigenous breed of pigs.
3. Describe in detail the distinguishing characteristics of four exotic breeds of pigs.
4. The indigenous breed of pigs has important characteristics making them relevant in cross breeding programmes. Discuss.
5. Describe the distinguishing characteristics of four breeds of rabbits.

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LECTURE SEVEN

Breeds of Cattle, Sheep and Goats

Introduction

Cattle, sheep and Goats are examples of livestock classified as ruminants; those animals having complex stomach that is divided into four compartments namely, rumen, omasum, reticulum and abomasum. They feed mainly on forages (grasses and legumes) and roughages (hay, stubbles, straw etc.). They are also described as animals that "chew the curd" (a process of rumination and regurgitation). Other examples of this group of livestock are Buffalo, Camels and Llamoids (Ilamas). As earlier mentioned in the previous chapter, breeds discussed will be classified as local or exotic with more emphasis placed on the description of local breeds. However, it is important to note that these group of livestock can be classified into four categories based on their utilization; meat, milk, dual or general purposes. The present trend in developed economies is the selection and breeding of each species of livestock for a specific purpose.

Objectives

Students should be able, at the end of this lecture to:

1. Identify the different local and exotic breeds of cattle, sheep and goats.
2. Explain various traits of breeds of cattle, sheep and goats as a guide in helping a stock person make a good selection to suit local conditions and personal preferences.
3. Compare local and exotic breeds with a view to identifying exotic breeds that can be utilized in upgrading of the local breeds.

Pre-Test

1. Enumerate the advantages of local breeds of cattle, sheep and goats over that of exotic ones.
2. Give a brief note on what to look out for, when selecting a breed of cattle for meat or milk.
3. List two examples each of exotic breeds of cattle, sheep and goats.
4. List two examples each of local breeds of cattle, sheep and goats.
5. Explain the following terms: pure-breed and cross-breed.
6. What are the factors, which affect prices to be paid for breeding stock?

CONTENT

Breeds of Cattle

All domesticated cattle belong to the genus *Bos* of the *Bovidae* family. The genus can be further divide into four subgroups; *Taurine*, *Bibovine*, *Bisontine* and *Bubaline*. Of these groups, the Taurine subgroup is of great importance because it includes the two most important cattle species which exist today which are *Bos taurus* and *Bos indicus*. The *Bos taurus* is also known as the European type cattle. Most of the indigenous breeds found in tropical Africa originated from the Zebu type cattle *Bos indicus* with few having the characteristics of the European type cattle. It is important to note the major differences between the *Bos taurus* and *Bos indicus* cattle:

Bos taurus **(European Type Cattle):** are humpless cattle with rounded ears held at right angles to the head. They possess short and wide heads. Their skins are relatively thick and are held tightly to the body. Dew laps, umbilical folds and briskets are small. Hair is relatively long, rough and double coated with seasonal difference in length. They possess short legs and are slow in movement. They are fast maturing with full mouth in four years. Adult animals are relatively large with fully-grown bulls reaching 1000kg liveweight.

Bos indicus **(Zebu Type cattle):** Hump is present in the thoraicic or cervico-thoracic region with long, drooping ears that are pointed. The head is long and comparatively narrow. Skin is thin and held very loose, often falling away from the body in folds. Dew lap, umbilical fold and brisket are extensively developed. Its hair is relatively short and smooth coated with little or no seasonal difference in length. It possesses longer legs and is

faster in movement. It is slow maturing with full mouth in six years. Adult animals are relatively small with fully grown bulls of most breed rarely exceeding 750kg.

The Indigenous Breeds of Cattle

White Fulani

This is a typical West African Lyre-horned Zebu commonly grazed by the Fulani people of Northern Nigeria. It is also referred to, depending on the locality as Bunaji, White Bororo, White Kano or Yakanaji. It is well adapted to climatic environment that is tropical and semi-arid. They are generally large animals with well developed humps. The dew lap is large and also well developed into folds. They possess erect ears, loose and pigmented skin, soft hair and horns that are medium to long. The horns are lyre-shaped, curving outward and upward. Coat colour is usually white with black points. However, it is not unusually to see few animals with coats that are black with blue flecking, or red and white. They are used primarily for milk production by the Fulani. They also fatten well on natural grassland and are good beef animal.

Sokoto Gudali

These cattle are typical of the short horned Zebu found in West Africa. This particular breed is commonly found in Sokoto province of North Western Nigeria, where the climatic environment is semi-arid and tropical. They are medium size, deep-bodied animals. Both sexes possess well developed hump that is almost cervico-thoracic and pronounced dewlap and umbilical fold. They possess pendulous ears, loose pigmented and moderately thick skin, and short hairs. The male has very short, laterally upturned horns, while the female has smaller but slightly longer horns. The usual coat colour is white or cream in the female and light grey or cream with dark shading over the poles, neck, shoulders and tail in the male. It is not unusual to find some males that are coloured dun with blue grey shading. They are primarily utilized as dairy-draught animals, but are also used for beef production. It is a fair milker under natural grazing conditions and as a work animal, it is slow, docile, sturdy and reliable.

N'dama

This is a humpless breed of the Hamitic longhorn type. The breed has acclimatized to the climatic environmental conditions in the rain-forest of West Africa. It is a small, humpless, well-built animal with a straight top

line and short, fine limbs. The dewlap and the umbilical fold are not large and the udder of the female is very small and set high between the legs. The skin is pigmented, with colour varying from black to light brown and the hair is soft and short. It possesses a short and broad head with ears that are small and horizontal. The horns are lyre-shaped growing sideways and then forward and upwards from the poll. In mature animals, they are 45-50cm long, circular in cross-section and white in colour with dark tips. However, polled cattle are not uncommon. Coat colour is usually yellow, fawn, light red or dun. There are also black and pied animals with black or fawn on a white background. The cows are poor milkers, and are used for draught purposes. They are essentially beef animals producing reasonably good carcasses under poor grazing conditions. Their notable attribute is their inherently tolerance to trypanosomiasis and reputation for longetivity.

West Africa Dwarf Shorthorn (Nigerian Shorthorn or Muturu)

The breed is found in coastal forest and savannah areas where the climatic environment is humid and tropical, but is also found in some drier areas where the rainfall is comparatively low. This breed is humpless, small, and thickset with short fine-boned limbs. The skin is tight and pigmented, the coat colour is usually black, dark brown or pied. The head is short and broad with horns that grow sideways, then upwards and curve forward at the extremities. Polled animals are also common. The breed generally possesses small dewlap. The cows are poor milkers, but possess reasonably good conformation and produce fairly good beef. They can be utilized for working purposes but they have limited stamina. They also exhibit tolerance to trypanosomiasis, but not as marked as that of N'dama.

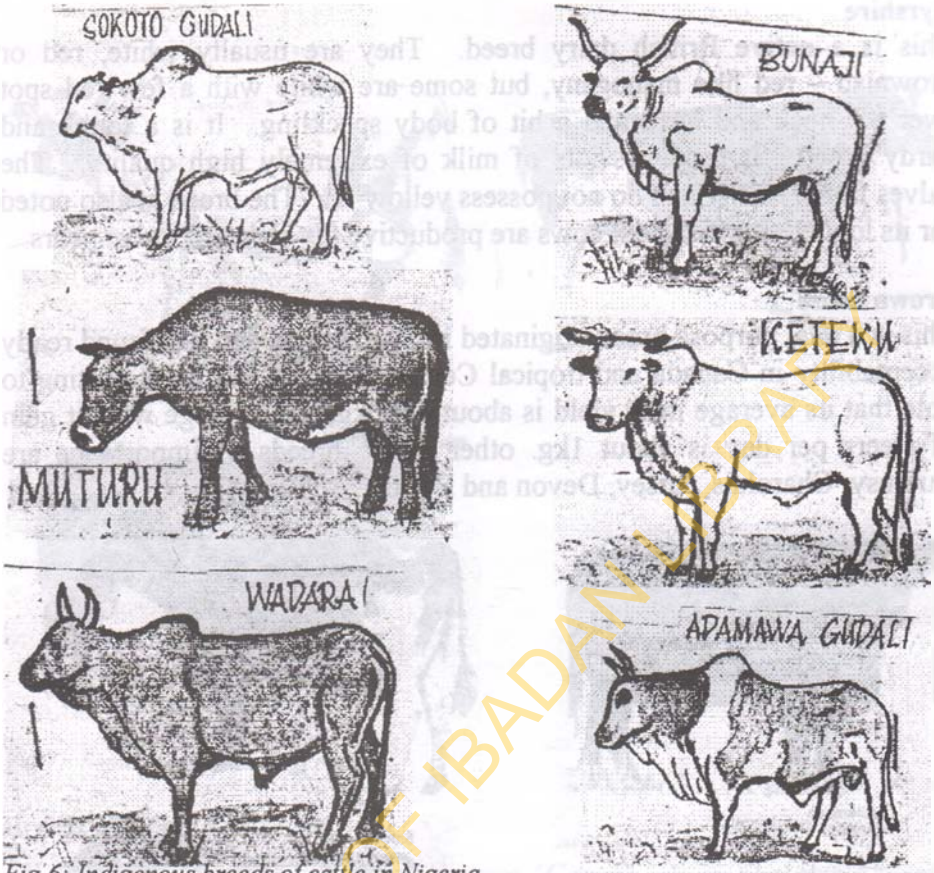


Fig 6: Indigenous breeds of cattle in Nigeria

The Exotic Breeds of Cattle

Friesian

This enormous breed is native to Holland. There are three types varying slightly from one another. These are, Holstein-Friesian, Black and White and Dutch Friesian. The bulls on the average weigh over 1000kg and cows about 700kg. Cows can produce 40-50kg of milk daily and average recorded 306-day lactation in Britain is 4,550kg.

Aberdeen Angus

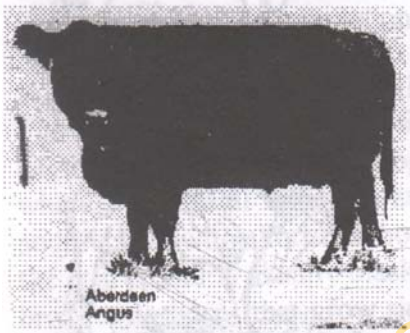
This is a Scotch beef breed that is noted for its early maturity and high proportion of high-to-low priced cuts and fat marbling. It is also hardy, adaptable and generally long-lived. Semen from Angus bulls are widely used in cross-breeding programmes.

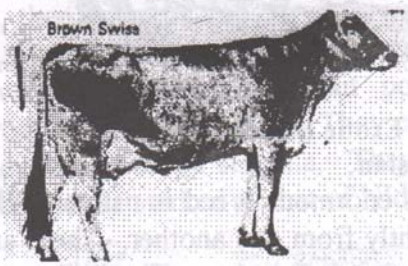
Ayrshire

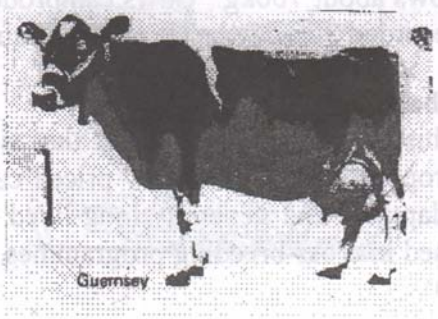
This is a native British dairy breed. They are usually white, red or brownish – red like mahogany, but some are white with a few red spot over the neck and head and a bit of body speckling. It is a tough and hardy breed. It produces lots of milk of extremely high quality. The calves fatten earlier and do not possess yellow fat. The breed is also noted for its longetivity, for most cows are productive for eight to twelve years.

Brown Swiss

This is a dual purpose breed originated in Switzerland and has found ready acceptability in Canada and tropical Central America. It is interesting to note that its average milk yield is about 4000kg, and average weight gain of steers per day is about 1kg. other exotic breeds of importance are Guernsy, Charolais, Jersey, Devon and Bond d'Aquitaine.







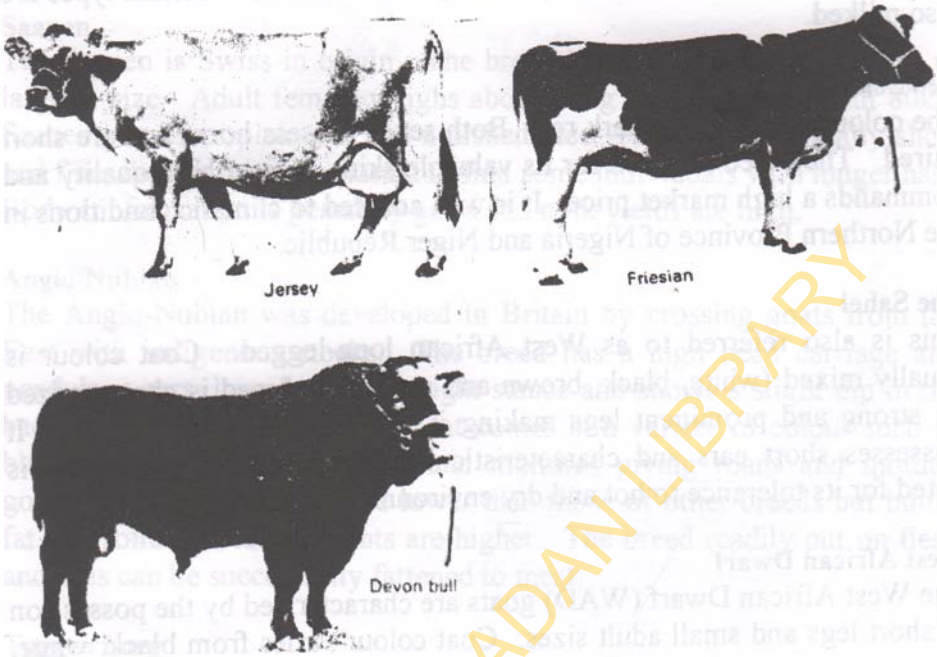


Fig 7: Some exotic breeds of cattle

Breeds of Goats

All domestic goats belong to the genus (*Capra*). It is likely that goat originated in Western Asia and was one of the first animals, and certainly the first ruminant to be domesticated. Probably all the breeds known today are descendants of *Capra aegagrus*, although certain types of the less common wool-bearing goats may be related to the wild species *Capra falconeri*. Goats are usually classified according to their function as meat, milk, or wool breeds. This classification however, breaks down when goats are used for two or more purposes. Goat is important in worldwide terms as a meat producer, although it is valued as a dairy animal in temperate regions. Other products derivable from goats include skins for leather manufacture, hair (mohair and cashmere), and on a small scale, manure. Goats are important in developing countries characterized mainly by subsistence and sometimes peasant agriculture.

The Local Breeds of Goats

Breeds of goats found in Nigeria are usually subdivided into a large number of sub-breeds known by their colour and district, e.g. Bornu

White, Sokoto Red, Kano Brown, Bornu Red, Bauchi Type, Sahel and West African Dwarf. They are primarily meat breeds but certain types are also milked.

Red Sokoto (Maradi)
The colour is uniformly dark red. Both sexes possess horns and are short haired. The breed is noted for its valuable skin. It is of high quality and commands a high market price. It is well adapted to climatic conditions in the Northern Province of Nigeria and Niger Republic.

The Sahel
This is also referred to as West African long-legged. Coat colour is usually mixed (white, black, brown and red). The breed is characterized by strong and prominent legs making it well adapted to nomadism. It possesses short ears and characteristic horizontal horns. The Sahel is noted for its tolerance to hot and dry environment.

West African Dwarf
The West African Dwarf (WAD) goats are characterized by the possession of short legs and small adult sizes. Coat colour varies from black, white, brown, grey to a mixture of these colours. Both sexes are horned but this is more prominent in males than in females. WAD goats are hardy and well adapted to the humid and forest zones of Nigeria. They are noted for their high resistance to trypanosomiasis. The breed is prolific and principally reared for meat.

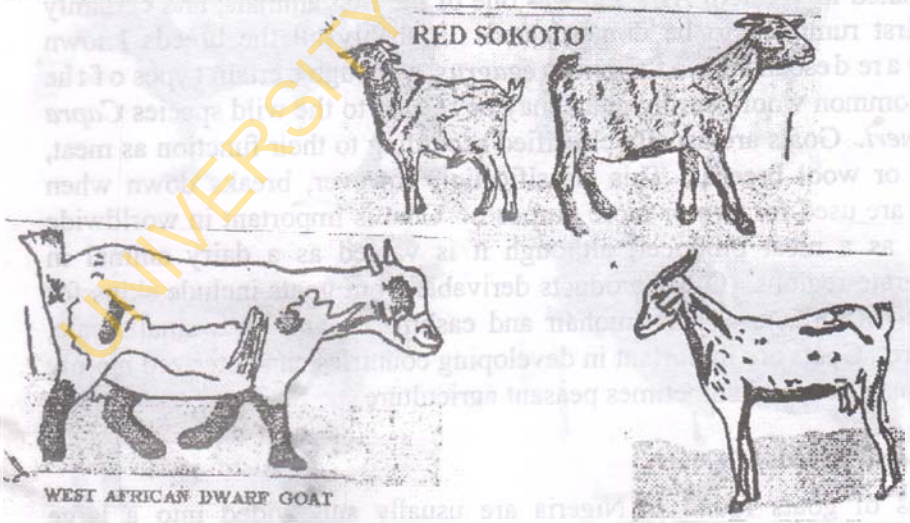


Fig 8: Indigenous breeds of goats

The Exotic Breeds of Goats

Saanen

The Saanen is Swiss in origin. The breed is white in colour, medium to large in size. Adult female weighs about 70kg and the male about 80kg. Saanen possesses pink ears and a dished face. The coat is normally short and fine, though it is not unusual to find some individuals with longer hair. Body conformation is generally good and milk yields are high.

Anglo-Nubian

The Anglo-Nubian was developed in Britain by crossing goats from the East with indigenous stocks. The breed has a high head carriage and pendulous ears, long legs, an upright stance and shows a slight dip in the back behind the withers. The goat comes in a variety of colour such as black, red, grey, white, cream and mixtures giving roans and mottled goats. Milk yields tend to be lower than those of other breeds but butter fat and solid non fats contents are higher. The breed readily put on flesh and thus can be successfully fattened to meat.

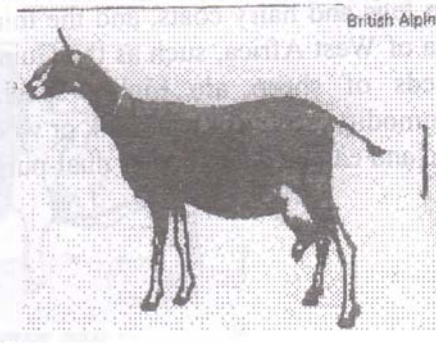
Toggen burg

The breed is Swiss in Origin. It is described as a small to average size with mature females weighing around 45kg. Coat colours vary from fawn to light brown with white markings on the face, lower leg and around the tail. The hair is usually soft, fine and of medium length. Some individuals show longer, silky hair along the spine and on the flanks. The breed usually does well on extensive, free-range systems of management.

Angora

The Angora goat originated in Asia Minor and has been prized for centuries for its fleece, which is a mixture of hair and a fine soft-handling fibre called cashmere. It is regarded as a good milker. Other breeds are the French Alpine, British Alpine, La Mancha and Golden Guernsey.


Golden Guernsey


British Alpine

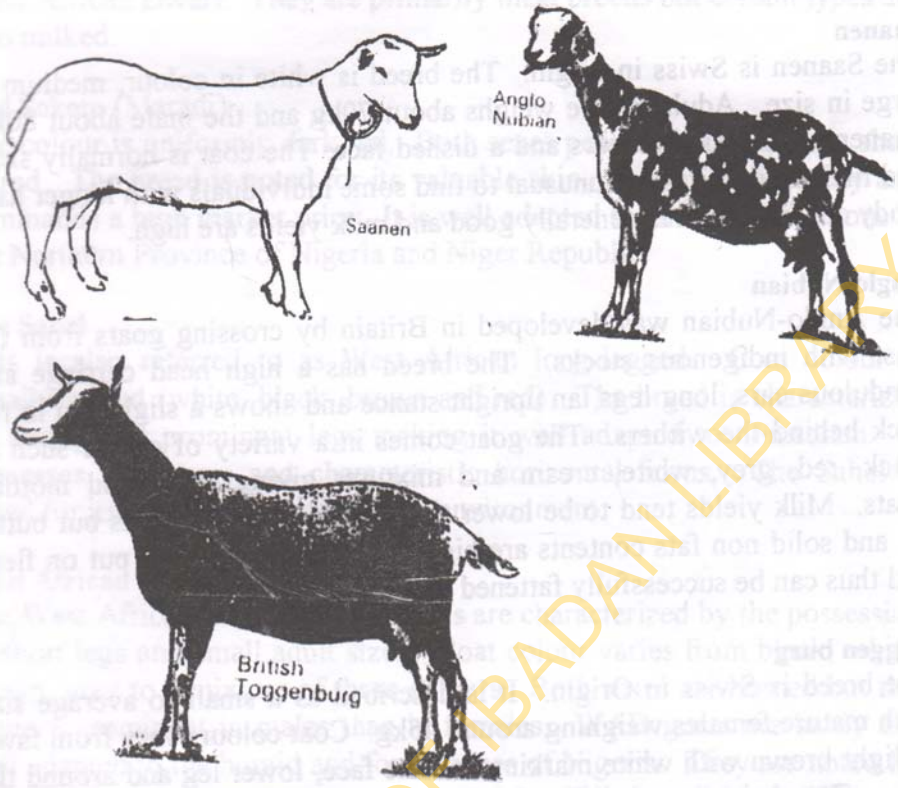


Fig 9: Some exotic breeds of goats

Breeds of Sheep

Sheep are classified in the sub-family Caprinae. All domestic sheep are believed to be included in the *Ovis aries*. No wild sheep were domesticated in Africa. Four different major types of sheep have been introduced at different periods into Africa after domestication in Asia. Examples of these are the West African Dwarf sheep found predominantly in the forest zones of West Africa and are characterized by small sizes, thin legs and hairy coats, and the thin-tailed hairy sheep of the Savannah area of West Africa, such as the Guinea and Hausa breeds. Some modern breeds of sheep are highly specialized for the production of one commodity, such as meat, milk or wool, while others are of a more general type and can be described as dual-purpose or even triple-purpose.

The Local Breeds of Sheep

West African Dwarf Sheep

This breed is also referred to as the Southern forest sheep. It is predominantly found in the more humid zones of West Africa. The coat is usually white in colour or a mixture of black and white. It is not unusual to find those with brown or a mixture of brown and white. The hair on the coat is fine with the possession of a well-developed neck ruff. The breed thrives well in areas infested by ticks and tse-tse flies. Average mature weight is approximately 36kg for both sexes.

Ouda

This breed is mainly reared by the Fulanis. It thrives well in hot and dry areas of the Northern states of Nigeria where the animals are particularly adapted to nomadic practices. They are large framed sheep, long-legged, thin and long-tailed. They also possess moderately long, floppy ears. The males are horned, sometimes quite large, emerging sideways and slightly backwards with a twist. Average mature weights for males and females are 70kg and 40kg respectively.

Yankasa

The breed is also referred to as "Hausa". It is commonly reared by the Hausa where it is well adapted to the climatic conditions in savannah and Sahel zones. The colour is usually white with black spots around the ears, eyes and sometimes around the feet. The males are horned and the females hornless. The average mature weights for the males and females are 45kg and 35kg respectively.

Balami

This breed is predominantly reared in the Bornu province of North-Eastern areas of Nigeria. It is the largest breed of sheep in Nigeria with a fast growth rate. The lambs can attain a weaning weight of 18kg in 12 weeks. Coat colour is predominantly white.

WEST AFRICAN DWARF SHEEP

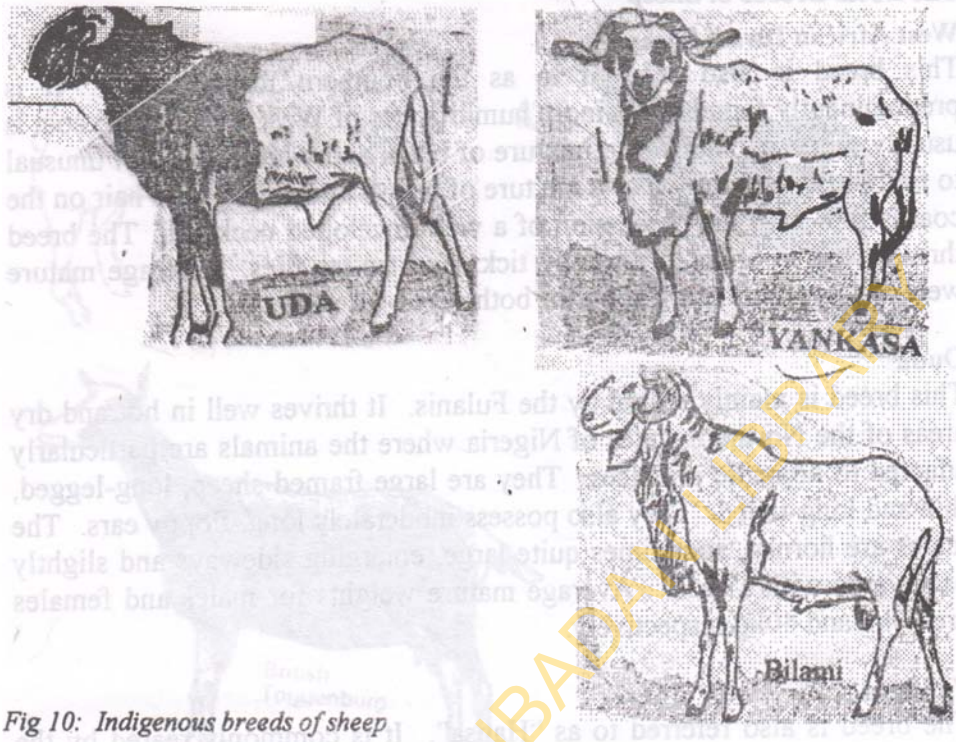


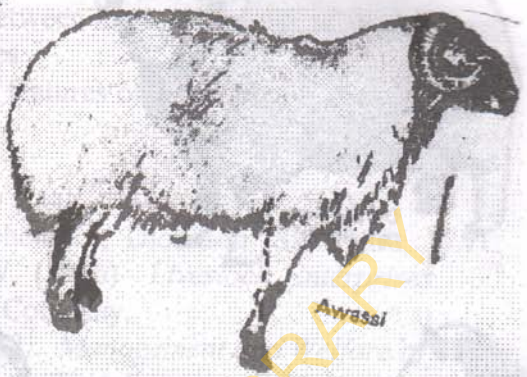
Fig 10: Indigenous breeds of sheep

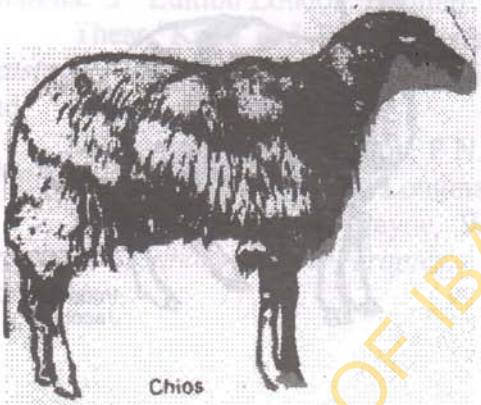
Exotic Breeds of Sheep

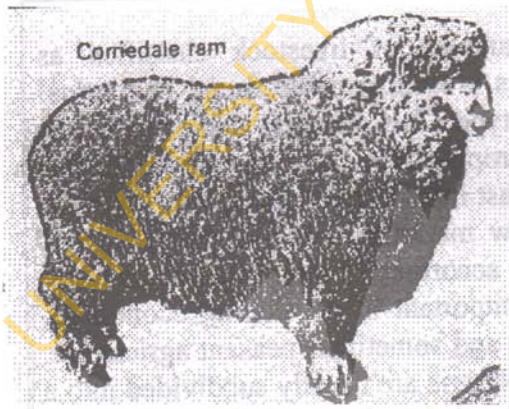
The exotic breeds of sheep are numerous and have been grouped into seven categories, according to their use namely:

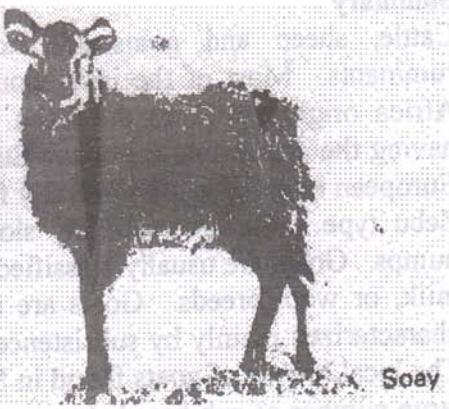
i. **Milk (or Milch) Breeds**: Fries Melkschaap, Lacaune, Awassi etc.
ii. **Wool and Pet Breeds**: Bradford count, Merino, Polwarth, Longwools Romney.
iii. **Primitive Breeds**: Soay, Herbridean, Jacob.
iv. **Hill or Range Breeds**: Scottish Blackface, Whitefaced Woodland, Welsh Mountain.
v. **Crossing Breeds**: Wensleydale, Border Leicester, British Milksheep etc.
vi. **General Purpose Breeds**: Corriedale, Devon Closewool, DorsetHorn, Clun Forest etc.
vii. **Meat Breeds**: Oxford Down, Suffork, Texel etc.

Lincoln Longwool ram









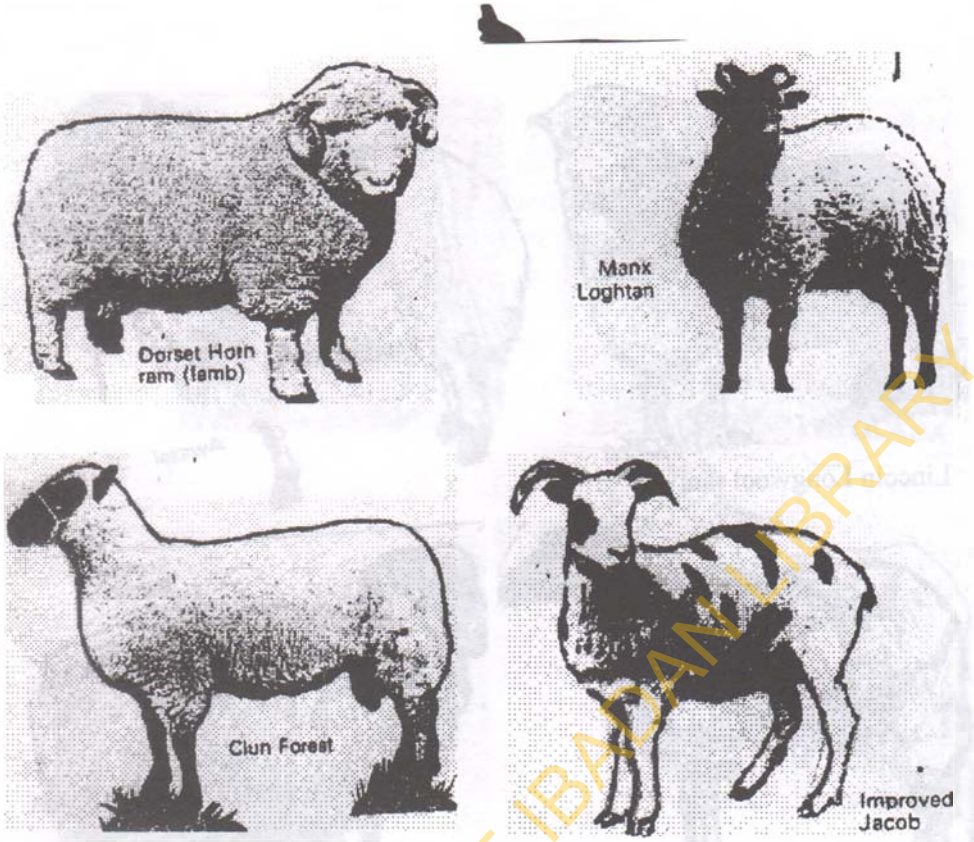


Fig 11: Some exotic breeds of sheep

Summary

Cattle, sheep and goats are examples of livestock classified as ruminants. Most of the indigenous breeds of cattle found in tropical Africa originated from the Zebu type (*Bos indicus*) cattle with few having the characteristics of the European type (*Bos taurus*) cattle. The European type cattle are generally fast maturing and humpless while the Zebu type cattle are relatively slow maturing with the possession of humps. Goats are usually classified according to their function as meat, milk, or wool breeds. Goats are important in developing economies, characterized mainly by subsistence and sometimes peasant agriculture. The local breeds of goats found in Nigeria are usually subdivided into a large number of sub-breeds known by their colour and district. No wild sheep were domesticated in Africa. The local breeds of sheep found in Nigeria are descendants of those introduced at different periods into Africa.

Post –Test

1. Highlight the differences between the local breeds of cattle, sheep and goats and the exotic ones.
2. Describe the distinguishing features of three local breeds of cattle, sheep and goats.

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WORK SHEET

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Course Title:..... Date:.....

LECTURE EIGHT

Principles of Livestock Genetics and Breeding (Mendelian Principles)

Introduction

It is a known fact that an individual animal or plant develops from a zygote, which is formed by the union (fusion) of gametes (egg and spermatozoa in the case of animals). To a great extent the characteristics of the individual (plants and animals) are as a result of characters (information) transmitted from the parents to the offspring via the gametes. We now know that the characters of the parent are contained in definite structures called genes, which are located in the chromosomes. The study of how characters are passed on from one generation to the next is called heredity, and a man called Gregor Mendel carried out the pioneering work.

In livestock production, it is desirable to allow, say a bull and cow with high milk producing genes to mate so as to have offspring that would produce more milk. This cannot be achieved except the principles involved in livestock breeding and genetics are thoroughly understood.

Objective

At the end of this lecture, students should be able to explain how characters are transmitted from parents to their offspring.

Pre-Test

1. Explain, with examples, the meaning of the following terms:
   (a) Genes (b) Chromosomes (c) Hybrid (d) Mutation
2. Explain Mendel's First and Second Laws of Inheritance.

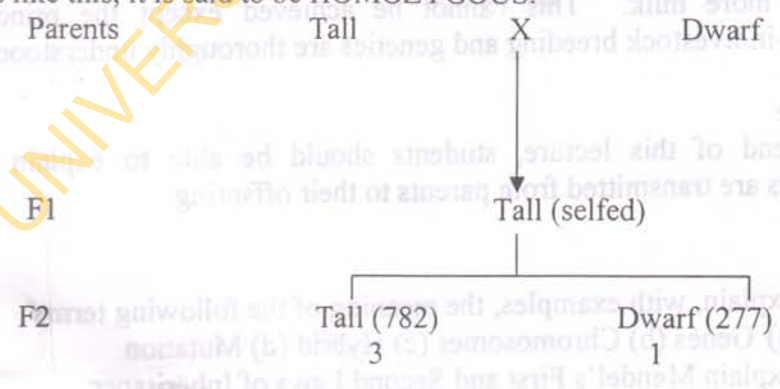
CONTENT

Our lectures will be centered on Monohybrid inheritance, Dihybrid inheritance and Mendel Laws.

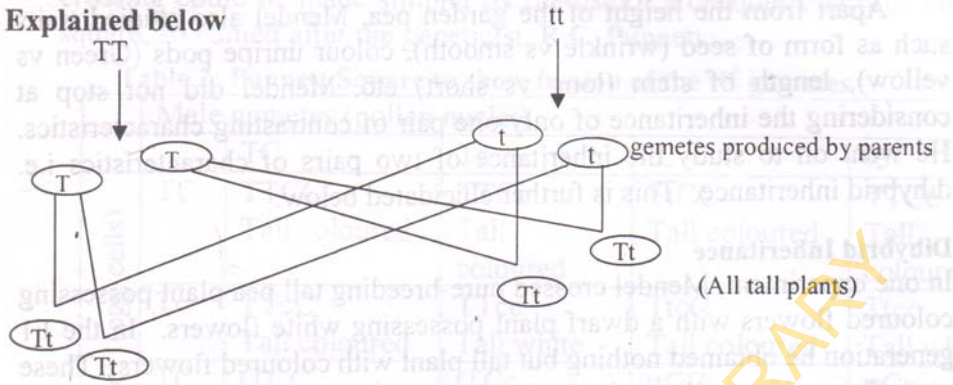
Inheritance

In livestock, characters otherwise known as traits are present in genes that are transmitted via the chromosomes. Mendel studied the inheritance of one character (height of garden peas or colour of pigeon pea flowers). The study of one contrasting characteristics is known to geneticists as MONOHYBRID INHERITANCE

In one such experiment, Mendel chose a pure-breeding tall pea plant and crossed it with a dwarf plant. He found that all the seeds obtained gave rise to tall plants; no dwarf plants being produced at all. These plants belong to what is called the first filial generation (or F_1 for short). Mendel went ahead to self-pollinate one of the F_1 and the resulting seeds were sown and the offspring (belong to the second filial or F_2 generation) were carefully examined. Mendel found that the F_2 plants were a mixture of 787 tall plants and 277 short (dwarf) plants, i.e. approximately three-quarters were tall and one-quarters dwarf. In other words the proportion of tall to dwarf plants approximates to a ratio of 3:1. Mendel put his conclusions into a general statement known as Mendel's Law, or the Law of segregation. Mendel's first Law states that the characteristics of an organism are controlled by genes occurring in pairs. Of a pair of such genes, only one can be carried in a single gamate. In the example of crossing given below, the gene for tallness is represented by T, and the gene for dwarfness by t. TT (a pair of tallness) in this case represents tall plant while tt represents dwarf plant. When an organism contains identical genes like this, it is said to be HOMOZYGOUS.

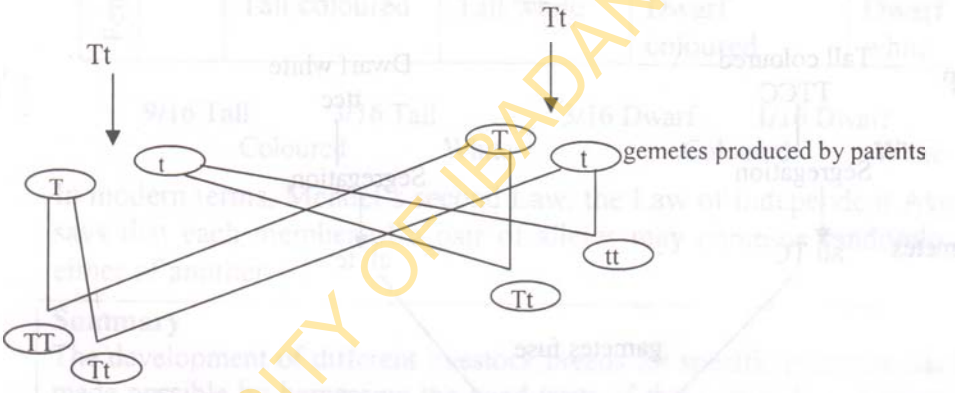


Explained below



F_1

But



Tall Tall Tall short (dwarf)

3 : 1

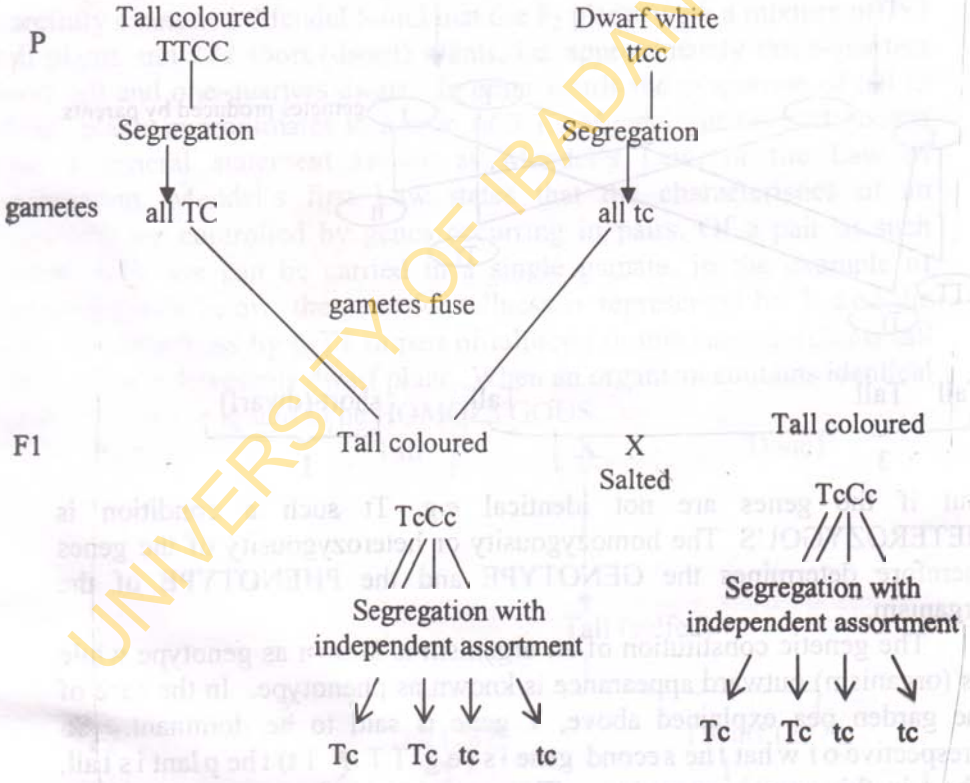
But if the genes are not identical e.g. Tt such a condition is HETEROZYGOUS. The homozygousity or heterozygousity of the genes therefore determines the GENOTYPE and the PHENOTYPE of the organism.

The genetic constitution of an organism is known as genotype while its (organism) outward appearance is known as phenotype. In the case of the garden pea explained above, T gene is said to be dominant. So irrespective of what the second gene is (e.g. TT or Tt) the plant is tall. The t in this case is recessive. The gene t can only express itself if it appears in tt i.e. the double recessive form.

Apart from the height of the garden pea, Mendel also studied traits such as form of seed (wrinkle vs smooth), colour unripe pods (Green vs yellow), length of stem (long vs short) etc. Mendel did not stop at considering the inheritance of only one pair of contrasting characteristics. He went on to study the inheritance of two pairs of characteristics i.e. dihybrid inheritance. This is further elucidated below.

Dihybrid Inheritance

In one experiment, Mendel crossed pure-breeding tall pea plant possessing coloured flowers with a dwarf plant possessing white flowers. In the F1 generation he obtained nothing but tall plant with coloured flowers. These were then self – pollinated. In the F2 generation four different kinds of plant were produced: (1) tall with coloured flowers; (2) tall with white flowers; (3) dwarf with coloured flowers; and (4) dwarf with white flowers.



Attempt to cross the assorted gametes from F_1 to get the F_2 generation.

The above crossings look very complicated and confusing. However this crossing could be made simpler by the use of a chequer board or Punnett square, so named after the geneticist, R.C. Punnett.

Table 2: Punnett Square to show fussion of the F1 gamates

		Male gametes (pollen nuclei)			
		TC	Tc	tC	tc
Female gametes (egg cells)	TC	TTCC Tall coloured	TTCc Tall coloured	TtCC Tall coloured	TTCc Tall coloured
	Tc	TTcC Tall coloured	TTcc Tall white	TtcC Tall coloured	Ttcc Tall white
	TC	tTCC Tall coloured	tTCc Tall coloured	ttCC Dwarf coloured	ttCc Dwarf coloured
	Tc	TTcC Tall coloured	Ttcc Tall white	ttcC Dwarf coloured	ttcc Dwarf white

9/16 Tall Coloured 3/16 Tall White 3/16 Dwarf Coloured 1/16 Dwarf White

In modern terms, Mendel's second Law, the Law of Independent Assorted says that each member of a pair of alleles may combine randomly with either of another.

Summary

The development of different livestock breeds for specific purposes has been made possible by harnessing the good traits of these animals and transferred to other future generations. This aspect of livestock production is called livestock genetics and breeding.

The characters (traits) of parents are contained in the genes, which are located in the chromosomes. The science that deals with how such characters are transferred from parents to offspring is called Heredity. Gregor Mendel and Austrian Monk pioneered this work. Gregory Mendel studied the garden pea and came to the conclusion that, (1)in a monohybrid inheritance characters are controlled by genes which occur in pairs and such pairs segregate when they are transferred to offspring (Mendel's 1st Law of segregation). (2) In a dihybrid inheritance that members of the controlling factors (genes) may combine in a random fashion (2nd Mendels Law of independent assortment of genes). The phenotypic ratios of Mendel's 1st and 2nd laws are 3:1 and 9/16:3/16:3/16:1/16, respectively.

Post – Test

1. Write short notes on the following
   (a) Monohybrid inheritance.
   (b) Dihybrid inheritance.
2. Explain the applications of Mendelian principles to livestock production.

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LECTURE NINE

Methods of Identification of Farm Animals

Introduction

In modern livestock production, it is important to keep up-to-date, reliable and accurate records of all the animals on your farm. This will enable you to monitor growth rates, cull diseased animals, identify female animals on heat etc. kept on the farm. It is quite possible to identify a flock size of 2 goats or sheep based on coat colour or sex basis. However, by the time the herd size grows larger to say 20 or 30 or more it becomes impossible for you to identify each animal based on colour or sex alone. For this reason it becomes necessary to look for other methods of identification of livestock and also shows proof of ownership when such an animal is stolen or lost.

Whichever method of identification is chosen it must be economical, temporary or permanent, not damaging to the animal and the handler, and must be readable from a distance away.

Objectives

At the end of this lecture, students should be able to:

1. Explain identification techniques for different livestock species.
2. Identify the advantages and disadvantages of the identification techniques learnt.

Pre-Test

1. What do you understand by the term livestock identification technique?
2. List six livestock identification techniques that you are familiar with.

3. State three advantages and two disadvantages of any 4 methods mentioned in 2 above.

CONTENT

Livestock Identification Methods / Techniques

Livestock identification technique is the act of **marking** an animal so as to distinguish it from other animals. Two goats can be distinguished from each other based on sex or coat colours. However for larger herd, other identification methods are applied. These methods can be categorized into Non Permanent Marking, which includes neck chain, ear tags, anklet straps, brisket tag, and neck chain with tag, flank tag, tail tags, and marking with paints, dyes or crayon. The second category of identification method is Permanent Marking, which includes branding, tattooing and notching. These methods will now be discussed.

Tagging

Tags or labels made of metal, wood or plastic on which the identification number of the animal is imprinted/written are fixed in the ear lobe of the animal or on other appendage or they may be attached to chains around the neck or the horns as indicated in Fig. 12 (a) and 12 (b). In some cases the tag is attached to the tail (tail tag), brisket (brisket tag). This method of identification can be done for cattle, sheep, goats, pigs and rabbits. In special cases the plastic tag may be tied to the wing or leg of birds. This is called wing or leg banding. This is also referred to as wing or leg tagging.

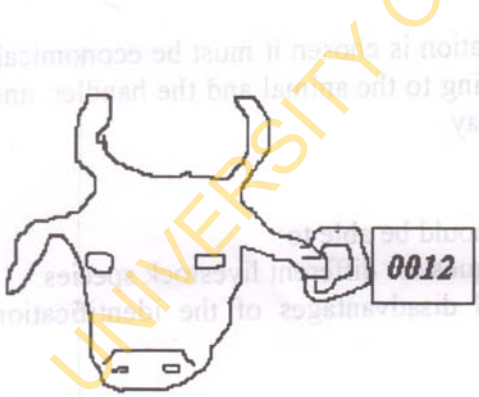

Fig. 12: (a) Ear tag

Fig. 12: (b) Neck chain

Tagging is a useful method of identifying farm animals under intensive management; but under extensive bush management, the tags may not be clearly visible from a distance and moreover there is often loss of tags.

Use of Dyes

This is achieved by use of special dyes or indelible ink to mark the coat of the animal. Most of the dyes wear off the coat of the animal and may need to be re-marked often. Some dyes may however persist for several months while some bleach–based dyes may last for up to one year.

Branding

A mark, number, design or letter is made on the skin of the animal using hot iron, caustic soda or branding irons cooled to a very low temperature. Branding is of two types – hot branding and cold or freeze branding. We shall attempt to distinguish between these two forms of branding. In Hot Branding, a piece of iron moulded into a designed number, letter or design is heated to a bright red and is applied to the skin with light pressure for not more than three seconds. The numbers should be sufficiently large and well separated to make them readable from a distance. In Cold or Freeze Branding, the metals, usually solid brass is cooled in liquid nitrogen or a mixture of ethyl alcohol and solid carbon dioxide. The cooled metal is then applied to the skin of the animal between 15 and 30 seconds.

Freeze branding cause less painful to the animal, skin damage is minimal and therefore hide damage is also greatly reduced too as compared to hot branding.

The easiest and most visible place to apply the branding to cattle is on the upper aspect of the quarter (Fig. 13), trunk or shoulder.

Fig. 13: Cow branded on the upper quarter

Tattooing

This consists of piercing outlines of desired numbers or letter on the skin on the inside of ears. The punctures made are then rubbed with indelible ink (tattooing ink) to make the numbers or letters visible. A major disadvantage of this method of identification is that the tattoo figure cannot be read except at close inspection of the animal. This method is most suitable for marking newborn calves and pigs. However, care must be taken to avoid puncturing the blood vessels of the ears. Moreover, the tattooing tools (tattooing forceps, tattooing ink and letters, and figures) must be clean to avoid contamination. An example of ear tattooing is shown in fig 14.

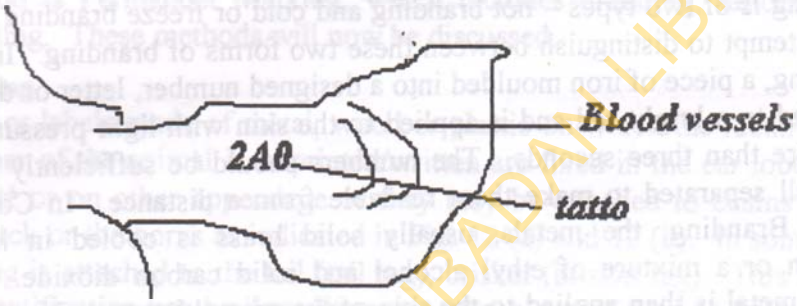

Fig. 14: Ear tattooing. (Note that the tattoo is made where there are no blood vessels)

Ear Notching

This is the cutting off of part of the ears with a pair of special pliers to identify an animal. You can practice this method of identification on cattle, sheep, goats and pigs. It is however found most useful when applied to pigs and long-eared sheep and goats. Ear notching is more efficient in older animals unlike in younger and growing animals that experience the growing together of the punched ears again. Another drawback of this method is that the notches can be easily changed so that fraud is relatively simple.

In notching the ear you decide where the notches go (right or left ear) and what the number represented by each notch and at what position along the edge of the outer ear. It is preferable to keep the number as low as possible. An example of the method that can be used for cattle is shown in fig.15.

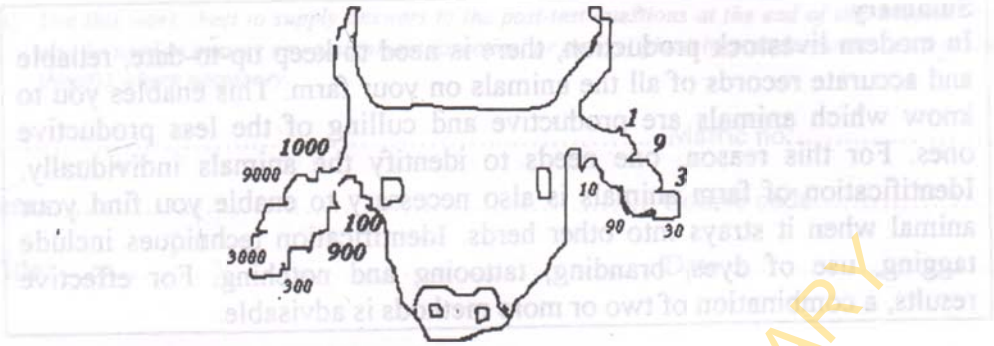

Fig.15: A method of ear – notch identification for cattle

With the example above, say you wish to number the 4569th cow in your herd of the cattle then notches will be as shown in fig.16.

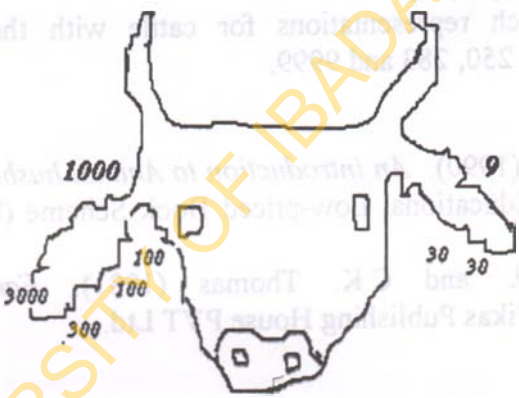

Fig.16: A cattle number 4569

In addition to all the identification methods described above, animals can also be identified by their natural marks (spots, patches, colour, and scars) or by photographs.

Summary
In modern livestock production, there is need to keep up-to-date, reliable and accurate records of all the animals on your farm. This enables you to know which animals are productive and culling of the less productive ones. For this reason, one needs to identify the animals individually. Identification of farm animals is also necessary to enable you find your animal when it strays into other herds. Identification techniques include tagging, use of dyes, branding, tattooing and notching. For effective results, a combination of two or more methods is advisable.

Post-Test

1. What do you understand by the term livestock identification?
2. List five livestock identification techniques that you are familiar with.
3. State three advantages and two disadvantages of any 4 methods mentioned in 2 (above).
4. Draw ear-notch representations for cattle with the following numbers: 100, 250, 283 and 9999.

References

Payne, W.J.A.(1990). *An introduction to Animal husbandry in the tropics*, 4th Edition. Educational Low-priced Book Scheme (ELBS) with Longman.

Sastry, N.S.R. and C.K. Thomas (1981). *Farm Animal Management*. India: Vikas Publishing House PVT Ltd.

WORK SHEET

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LECTURE TEN

Some Common Livestock Management Operations

Introduction

In the last lecture, we examined different methods of livestock identification as one of the tasks carried out on the farm. In this lecture, we will discuss further some other routine management operations that farmers may have to carry out for a successful animal production and management.

These management operations are sometimes classified into two major groups namely: daily routines and occasional routines. Daily routines are those carried out on a daily basis while occasional routines are carried out periodically or once in the lifespan of the animal.

Objectives

At the end of this lecture, student should be able to:

1. Differentiate between some daily and occasional routines that are carried out on the farm.
2. Identify when, how and why these routines are necessary.

Pre-Test

Mention five routine operations that are important in rearing of a named farm animal from birth to maturity.

CONTENT

Description of the Day to Day (Daily) and Occasional Farm Operations

A. Day to Day(Daily) Farm Operations

The daily farm operations carried out on any farm will to a great extent depend on the management system and type of livestock kept by the

farmers. However some of these daily operations are common irrespective of the animals kept. Efforts will be made to highlight some of these common daily operations, and some uncommon but seemingly important daily farm operations will also be discussed.

(i)Cleaning: To prevent spread of diseases, cleaning of barns, pens, cages etc. must be done on a daily basis. Dirty feeding and drinking troughs are potential sources of transmission of disease- causing pathogens. Cleaning is usually the first daily operation to be carried out on the farm. It is also important to clean the surroundings.

(ii)Feeding: The animals are fed daily and given water frequently too. Poultry is fed *ad libitum*; pigs are usually fed twice a day. Cattle, sheep and goats (ruminants) are regular feeders except when ruminating while rabbits are intermittent feeders.

(iii)Egg collection and milking of dairy animals are also daily operations.

(iv)Exercising: Farm animals kept in confinement need to be exercised daily. Exercise helps normal body metabolic processes and also ensures good health. Exercised animals are more active than those not exercised. Animals that are over exercised tend to suffer leg and foot problems. Exercise is very important for the breeding male. Out-door exercise with exposure to sunlight provides vitamins D to the farm animals. Pregnant animals that are allowed regular exercise also tend to have less delivery problems.

(v)Grooming: This is the brushing of the hair coat of animals. It is performed for cleanliness and appearance. It also helps in stimulating blood and lymph circulation, to remove waste products like skin secretion, scurf and loose hair and to remove lice and other skin parasites from hair coat. Sick animals may also be detected during grooming.

B Occasional Routines

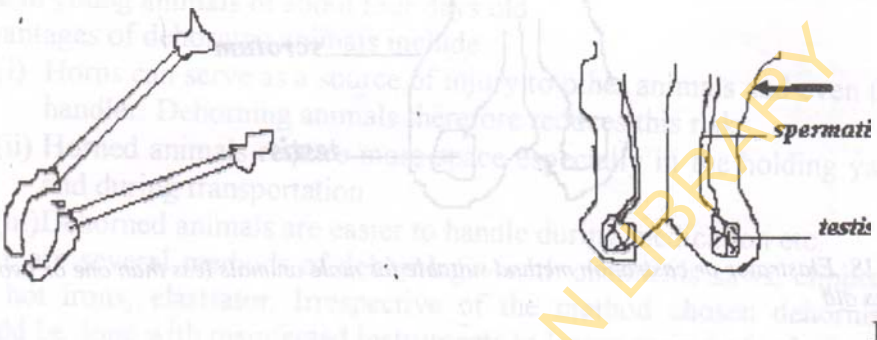
Occasional routines are those operations that are done periodically or once in the lifespan of the animal. Some of these routines are explained below.

(I)Castration

This is removal of testicles, the glands that produce male cells. Castration is done basically to prevent the animal from reproducing. Locally, male and female animals are kept together and allowed to roam together too. This encourages indiscriminate breeding. In organized commercial livestock production, the male and female animals are often separated or the males not needed for breeding are castrated. In poultry, the process of castration is called Caponization.

How is the Castration done?

(a) Burdizzo Castrator Method: An instrument called Burddizzo Castrato (Fig.17) is used to crush the spermatic cords. The crush spermatic cords make testicles functionless since they become starved of nutrients. This method of castration is bloodless and often used for younger animals.



A B

BB

Fig.17 Burdizzo castrator (A) used for bloodless castration of cattle B. The arrow shows the section where the Burdizzo castrator has to be applied over the neck of scrotum.

(b)Elastrator or Rubber Ring Method

A special pair of pliers is used to place a rubber band tightly over the upper portion of the scrotum into which the testicles have been carefully and safely manipulated. Over some time the scrotum shrinks and falls off (fig.18). This method of castration is suitable for calves, kids or lambs that are less than one or two weeks old.

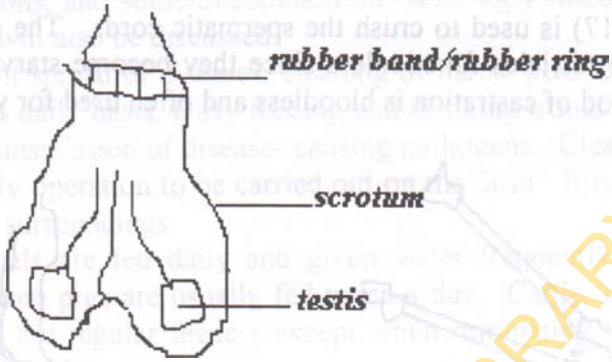


Fig. 18: Elastrator or castration method suitable for male animals less than one or two weeks old

(c) Open-Incision or Bloody Method

A sharp sterilized knife is used to cut off the lower part of the scrotal sac and the testes removed one after the other. The site of surgery is then disinfected. This method is bloody and more painful compared to the bloodless castrator method. However, it is more effective and reliable. This method is used on older animals.

(d) Use of Hormones

This method involves the use of hormones to suppress the male sex hormones. In especially caponization it is achieved by implanting a hormone in the back of the neck of the male chicken. A major disadvantage of this method is that caponized cockerels in tropical countries have been found to be more susceptible to heat stress than uncaponized birds.

Having treated the different forms of castration one may now ask what are the advantages of castrating male animals. Although a few reasons have been mentioned in this lecture, others are discussed below.

Advantages of Castrating Livestock

1. Castration of male animals reduces fighting in the sexually mature animals because such castrates (castrated animals) are less aggressive.
2. Castration removes characteristics male odour found in the uncastrated adult male goat (buck) and boar carcasses.

3. Castrated animals are more amenable to fattening (i.e. they grow faster). This point is however very controversial.

(II) Dehorning

Dehorning is the removal of horns of animals. While Disbudding which means the arrest of horn root is in the form of a 'bud' or 'button'. Dehorning is therefore carried out in older animals while disbudding is done in young animals of about four days old.

Advantages of dehorning animals include:

(i) Horns can serve as a source of injury to other animals and even the handler. Dehorning animals therefore reduces this risk.

(ii) Horned animals require more space especially in the holding yard and during transportation.

(iii) Dehorned animals are easier to handle during medication etc.

There are several methods of dehorning – with chemicals saws, clippers, and hot irons, elastrator. Irrespective of the method chosen dehorning should be done with disinfected instruments to lessen spread of infection.

Chemical Method

Chemicals such as caustic potash (KOH) or caustic soda (NaOH) are rubbed on the bud (soft growing horn) until it is almost bleeding. Vaseline or heavy grease is rubbed around the horn buds to protect the eyes against the chemical.

Hot–Iron Method

This method involves the application of specially design hot iron to the horn buds of young animals. The irons are heated in a portable forge or electrically. This method of disbudding is bloodless and can be used on young calves only.

Use of Dehorning Saw and Clippers

Clippers are good for removing the horns of younger animals but the hard and brittle horns of mature cattle can best be removed by saving them off. Any handy wood – cutting saw can be used in this respect. However this operation is bloody and the animal needs to be specially restraint while the operation lasts.

Use of Elastrator

A specially made rubber ring is placed over the horn well down into the hairline. This rubber ring is so tight-fitted that smaller horns drop off in three to six weeks while larger horns may take two months.

Breeding Method

When animals that are naturally polled (with horns) are crossed (mated) with those with horns some of their offspring then to be naturally polled. This method requires specialists called breeders. This form of disbudding is illustrated in fig.19.

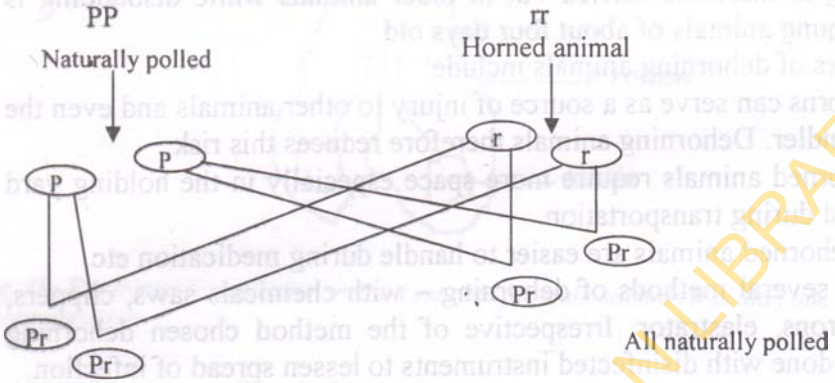


Fig. 19: Breeding method of dehorning

(III) Tail Amputation (Docking)

Lambs of wool breed shave their tail amputated at the time they are castrated, i.e. one to two weeks of age. The process of amputating the tail is called Docking. Lambs not docked accumulate a great deal of filth and faeces around the tail which may often get infested by maggot flies. Hot iron and docking knife or shears are common instruments used for docking.

(IV) Removal of Supernumery Teats

This is the removal of extra teats on the udder. If the extra teats are not removed it predisposes the animal to mastitis. The extra teats are removed with a pair of sharp surgical scissors.

(V) Teeth Clipping

In swine production it is an acceptable practice to chip the prominent teeth in the pig. This is done in the piglet. These prominent teeth ("wolf teeth") if not clipped may be a source of irritation to the udder of the sow and may predispose the sow to mastitis. The "wolf teeth" may also serve as a weapon when the pigs fight.

(VI) Debeaking

This is the partial removal of the upper beak of the chicken to prevent vice habit such as pecking, feather-pulling, cannibalism and egg eating. The instrument used for debeaking is called de-beaker. This can be

mechanical or electrical. In some cases a smaller portion of the lower beak is also removed. Debeaking is not a compulsory management operation except when vice habits mentioned above are experienced in the birds. This is after the farmer is satisfied that the recommended spacing and feeding requirements of the birds have been met.

Summary

A successful livestock production involves the timely operation of livestock management practices. These practices are carried out at specific time; either daily or routinely. Some of these operations are specific to certain livestock species but in some cases the operations are general and can be applied to all the livestock species. Day-to-day farm operations (daily operations) include cleaning of the houses farm animals, their feeding and drink equipment, feeding of the animals, egg collection, milking, exercising the animal especially breeding animals, and grooming. The occasional routines include; castration, dehorning, docking, removal of supernumery teats, teeth clipping, de-beaking etc.

Post-Test

1. Write short notes on the following
   (a) Castration
   (b) Dehorning
   (c) Docking
   (d) Debeaking
2. Mention some specific daily operations that are necessary in a poultry farm.

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Oluyemi, J.A. and F.A. Robert (1979). *Poultry production in warm wet climates.* 1st edition. London: Macmillan Press Ltd. and Basingstoke.

Pagot, J.(1992) . *Animal Production in the Tropics.* 1st Edition. London: Macm illan Press Ltd. and Basingstoke.

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LECTURE ELEVEN

Feeding Habits of Farm Animals

Introduction

Farm animals eat feeds to enable them maintain their bodies and to give products such as meat, milk and eggs. The feed must be adequate both in quality and quantity for the farm animals to carry out these functions effectively. Scientific research has made it possible to determine the feeding requirement of different classes of farm animals. In modern livestock farming, man therefore provides the animals with all their nutritional requirements. The feeding habits of farm animals essentially depend on class and age of farm animal, management and the climatic conditions. All these factors will be discussed in this chapter.

Objective

At the end of this lecture, students should be able to analyze what farm animals feed on, how they feed, when they feed and factors responsible for what, how and when they feed.

Pre-Test

1. List five classes of animal feed stuff.
2. Write on any three classes of animal feed stuffs listed in 1.
3. Distinguish between the digestive system of a named monogastric and ruminant.
4. Discuss briefly the effects of climate on the feeding habit of chickens.

CONTENT

Classification of animal foodstuffs, digestive systems of farm animals, effects of anatomy and physiological features of the digestive system, feed presentation, management practices and climate on the feeding habits of farm animals are to be discussed in this lecture.

Classification of Animal Feedstuffs

Foods of all kinds consumed by livestock are known as Feedstuff Feedstuffs can be classified into the following:

(a) **Róughages and Succulents**: The group includes grasses, succulent herbage, hay, and silage and green vegetables. Most of the members in this are high in fibre content that are readily digested by ruminants (cattle, sheep and goats) and less digested by non-ruminants (pigs and poultry).

(b) **Root and Tubers:** Cassava, sweet potato and other tubers are rich sources of carbohydrates in livestock feeds.

(c) **Concentrates:** These are feed or feed mixture that supply carbohydrates and fat .They are basically of plant origin. A major characteristic of this group of feed is that they are high in protein and most of the time low in fibre. The best-known concentrates are groundnut cake, coconut cake, palm kernel meal, seam meal. Concentrates are used as the main diet source for non– ruminants and as supplementary feed for ruminants.

(d) **Animal products:** Livestock get good quality protein from animal and animal by – products. Some examples of good sources of animal protein are milk, fishmeal, blood meal, and meat meal. However, animal by – products such as bone meal are good sources of animals.

(e) **Feed Additives**: Livestock feed are supplemented with other substances know as feed additives. The feed additives essentially supply minerals vitamins and some times amino acids in their concentrated forms. Antibiotics and hormones are also examples of feed additives. The feed additives are added in very small amounts but the action in animal performance is overwhelming.

Feeding Habits of Farm Animals

This topic will be discussed under the following headings:

Anatomy and Physiology of Digestive Systems of Farm Animals

The kind of feed the animal eats is largely dependent on the animal's digestive system. The principal organs of digestion include; mouth, esophagus, stomach, small intestine and large intestine. The mouth and its

components (teeth, tongue, cheeks, and salivary glands) vary with sieves of farm animal in question (fig 20, 21 and 22). In most farm animals, the functions of mouth are to bring in feed mechanically (physically) break it down and mix it with saliva, which acts as a lubricant to facilitate swallowing. There also exist variations among farm animals in the extent to which they masticate (chew) the food. This is determined by the kind of food they eat and the physical structures of the mouth and teeth. Ruminants for example grind thoroughly the grass or other forage they consume, although much of this occurs during rumination when the boluses are regurgitated and remasticated rather than at the time the forage is costumed. Cattle swallow grains with very little effective chewing. For this reasons their grains should be ground or cracked. Goats and sheep on the other are generally more efficient in chewing the grains than cattle. Poultry do not have teeth and as such they swallow their food whole and grinding is done by the action of the grit (sand) in the bird's gizzard. It is therefore conventional to add little amount of grit to the diets of poultry.

Poultry, rabbit and swine (monogastric) have simple stomach while ruminants (polygastrics) possess complex stomach (i.e. rumen, reticulum, omasum and abomasum). Ruminants regurgitate their food by a process called Rumination. The ruminant is characterized by the possession of rumen where microbial fomentation of food takes place. The rumen houses specific microorganisms (bacteria protozoa and fungi) that break down complex plant nutrient by cellulolytic (cellulose degrading) enzymes. When the rumen is filled, the animal lies quality and continue to regurgitate its food further. Rabbits do not possess rumen hence they do not have these specialized microbes to degrade cellulose and other complex carbohydrate. A little degree of microbial fermentation does occur in simple stomach animals. The rabbit has a unique digestive system that differ from that of poultry of the pig the digestive physiology of the rabbit is closer to that of the ruminant because the rabbit possess an extended caecum where microbial fermentation occur just as it happens in the ruminant. Furthermore the rabbit practices coprophagy, which is the eating of feaces directly from the anus. This practice is usually done at night or early hours of the mornings. During Coprophagy the soft faeces is swallowed and redigested to extract more nutrients from it. This greenish soft faeces is richer in protein and vitamin B complex when compared to the other pellet type of faeces (dry faeces) produced by the rabbit (Table 3). Coprophagy is a normal feeding habit in the rabbit. The rabbit even through a monogastric is referred to as a Pseudoruminant because of its

seemingly ruminating behaviour of a ruminant. Generally speaking the age of the animal will also determine type of feed consumed. Young ruminants e.g. lamb, kid, calf, when not weaned depend on milk for sustenance since at that age they have underdeveloped rumen and hence digestive system functions as that of the monograstric. This persists until the young ruminant is weaned.

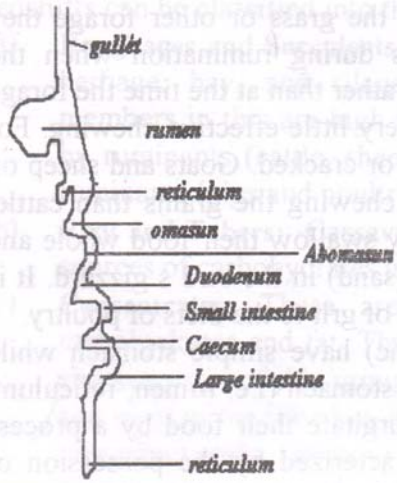

Fig. 20: (ruminant)

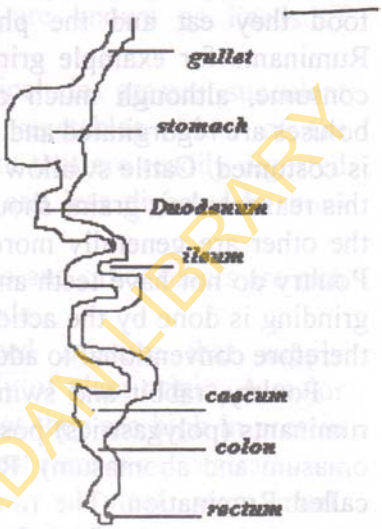

Fig. 21: (pig)

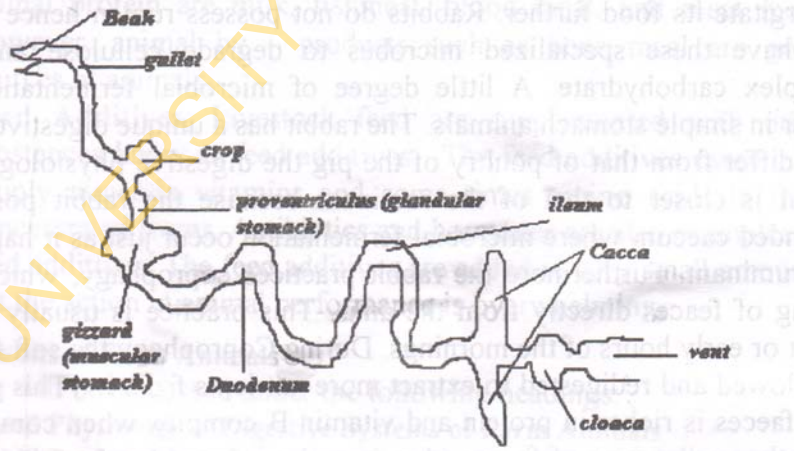

Fig. 22: Digestive System of Chicken

Table 3: The composition of rabbit faeces

% Dry matter	Dry faeces	Soft faeces
Crude protein	9.2	28.5
Ether extract	1.7	1.1
Crude fibre	28.9	15.5
NFE	52.0	43.7
Ash	8.2	11.2

Feed and Feed Presentation

Feed can be given in forage, meal, mash or pellets forms. Animals (except man) tend to eat to meet their energy requirements. Once this is met the animal stops eating. However animals also tend to avoid consumption of toxic feeds. The ruminants are particularly noted for this even though they can also detoxify (render harmless) some presumably toxic feeds. Ruminants prefer long hay, rabbits prefer succulent or pelleted feeds. Poultry on the other hand prefer mash, pellets or crumbs while pigs swallow their food in large chunks.

Management Practices

The management practices employed affects the eating behaviour of farm animals. Animals tend to eat faster when kept together than when individually caged. However, the weaker animals are often pushed aside by the stronger ones. The weaker animals are therefore last to feed. If any feed is left. Such weaker animals tend to grow slowly and may therefore have stunted growth because they do not take in the required amount of nutrients. A "pecking order" is often established in the herd or flock.

Appropriate stocking density should therefore be maintained when animals are kept together. The feeding and drinking troughs should be sufficient. Poor management may lead to increased feed intake. Example, an animal that has high level of worm infestation will always be hungry and will become unthrifty.

Cannibalism may also occur as a result of nutritional or climatic stress. Deficiency in amino acids has been found to lead to pecking in chickens. Likewise deficiency of salts like sodium chloride in chickens may also lead to cannibalism. Chewing of bones, woods, hair, cement or feathers by a farm is not a normal nutritional behaviour. This behaviour is a sign of nutritional deficiencies. Cannibalism is the eating of the carcass of members belonging to the same stock e.g. bird-eating flesh of living or dead birds.

Climatic Factors

Climate has a direct and indirect influence on the feeding habit of farm animals. The tropical environment is characterized by high average daily temperature the year round. All domesticated animals are homeotherms i.e. they have the ability to maintain their body temperatures with a wide range most suitable for optimal biological performance. For mammals, the normal range is $37^0 - 39^0$C ($98.6^0 - 102.2^0$F) while for poultry is $40^0 - 44^0$C ($104^0 - 111.2^0$F).

When animals eat they generate heat in the process and when the environmental temperature is unbearable the farm animals eat less. Thus they do this to reduce heat generated in order to maintain thermal balance. It is therefore common to find farm animals seeking for shade during the hot afternoons. Birds pant and eat less while ruminant graze during the night instead of hot afternoon.

Pigs tend to spend their time in wallows during hot afternoons. They also eat less during this period. The thick layer of fat (subcutaneous fat) makes perspiration impossible in the pig. Generally animal tend to consume more water and less feed when the ambient temperature is high.

Summary

Feedstuffs are classified into roughages and succulents, roots and tubers, concentrates, animal's products and feed additives. The feeding habit of livestock depends basically on the class of livestock-whether it is monogastric or ruminant. Monogastric e.g. chicken, swine and rabbits have simple stomach (one stomach) while ruminants e.g. cattle, sheep and goats have complex stomach (four stomachs namely; rumen, reticulum, omasum and abomasums). Monogastrics depends on their own enzymes to degrade food while ruminants, in addition to their own enzymes, also depend on enzymes secreted by microorganisms (protozoa, fungi, bacteria). However rabbits are referred to as pseudo ruminants because they can also tolerate high fibre diets. This is because of the extended caecum of the rabbits. In addition, the rabbit practices coprophagy (eating of its faeces). Other factors that influence the eating habit of livestock include; feed and feed presentation, management practices and climatic factors.

Post –Test

1. List factors that affect the feeding habit of livestock.
2. Discuss fully any 3 factors listed above.

Reference

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LECTURE TWELVE

Systems of Livestock Production

Introduction

The system of production is the method employed in rearing livestock. The animals are either permanently housed or permanently left out to grace or the combination of both systems. System of production depends on the livestock. The system of rearing pigs is not the same as that of raising poultry and also cattle.

Objectives

At the end of this lecture, the students should be able to:

1. Differentiate between the major systems of production.
2. Explain the advantages and disadvantages of these systems.

Pre –Test

1. State the local ways of keeping animals.
2. List the advantages and disadvantages of each method.

CONTENT

This lecture revolves round systems of livestock production would center on the intensive system, extensive system and semi-intensive systems.

The Intensive System

This method confines the animals with little or no opportunity for roaming about. Animals under this system are restricted within the building and they may be provided with some green forage or pasture in a fenced range

pens. Livestock must be in large number in order to justify the amount of money put in for the livestock investment.

A. Methods of Intensive System (Birds)

There are 2 methods under this system. They are battery cage and deep litter.

Battery Cage

This involves keeping layer birds in a single cage or in cage units throughout the period of laying. The cage is usually constructed with galvanized iron in such a way that will provide ventilation to the birds of all sides. The cage slopes forward into an egg cradle where the eggs going into the cage are averaged in rows and the rows are arranged in steps which may be from 2-6 tiers, two rows on the same step but facing opposite directions so that the birds are arranged back to back. Feeds and water troughs are arranged in front of each row. Feeder can be made of wood, aluminum bamboo or iron but water through is made up of aluminium and iron. The cage unit is usually placed on a trench into which the dropping fall. The droppings are clear away from time to time. In some commercial farms, provision of water and distribution of feed are automatic.

Deep Litter

Deep litter system consists of a fixed building with concrete floor; litter materials can be spread on the floor. The materials could be dry grass; wood dust crushed maize cobs, straw etc. The floor of the house is usually divided into pens with a center passage along the whole length of the house. The wall of the house is built 1m high and the top path is covered by wire mesh. The roof of the house can be covered by the asbestos or iron sheet. Feeding and water troughs are all provided in various parts of the house.

B. Features of Intensive System

(i) Building and housing should be well designed and constructed.
(ii) Large number of livestock can be stocked per unit area.
(iii) Incidence of disease outbreak is more common.
(iv) There is a considerable savings on labour due to limited spacing.
(v) Animals are easier to manage.
(vi) Sick animals are easily detected and cared for.

C. Advantages of Intensive System

(i) A high standard of sanitation is maintained.
(ii) Effective conversion of crop residues.
(iii) There is little damage to the environment.
(iv) Animals are easily monitored so that they are easily inspected and other management practices like vaccination and deworming.
(v) Total record of livestock is easily kept.

D. Disadvantages of Intensive System

(i) The system required high initial capital to construct the house and procure producing equipment.
(ii) The systems require high labour for feedings, washing and cleaning.
(iii) The battery cage is only useful to manage only adult birds and such birds occasionally suffer for cage fatigue.
(iv) In the litter, disease can spread easily among the birds because they are in close contact.
(v) Birds in deep litter also develop bite habits like egg sucking, feather picking and cannibalism.

The Extensive System

This is a system of livestock production such that livestock are kept in the open land. Animals are left to move about in a range in search of food for themselves at the same time animals are provided with little feed as supplements. The animals are housed in smaller units within the area. Such temporary sheds are made available for protection against unfavorable weather conditions and for the purpose of parturition.

A. Features of Extensive System.

(i) A requirement of large land areas.
(ii) Animals may be exposed to danger in the range.
(iii) Animals grow slowly since the feed is limited to what is vailable.

B. Types of Extensive System

The types of extensive system are the open range and range shelter methods.

The Open Range method

Under the open range method, the animals roam about in a large area of land and find their own food themselves. Such animals feed on seeds,

insects, plants, roots, fruits and kitchen wastes. The animals are not usually provided with cultivated pasture or any suitable shelter or any supplemented feeding.

The Range Shelter Method

It consists of a simple building used as a shelter for the animals to hide during an unfavourable weather and in the night. The shelter has a wire mesh side cover with the floor raise at about 1m of the ground. The shelter can be moved from one location to another.

C. Advantages of the extensive system

(i) Low labour cost i.e. unpaid labour is often used.
(ii) Animals are exposed to exercise and therefore, they are usually very healthy
(iii) There are higher returns because much money is not spent as cost of raising.
(iv) Livestock don't suffer from over crowding effect.
(v) Low initial capital input is involved.
(vi) Animals obtained protective foods from the range.

D. Disadvantages of extensive system

(i) Livestock are exposed to predators, thieves and infectious diseases.
(ii) There is no accurate keeping of records.
(iii) The system entails greater expanse of land, which may be impossible to get in the cities and urban centers.
(iv) Animals like birds lay their eggs indiscriminately on the range and such eggs are rarely found
(v) Livestock are exposed to extreme weather, excess heat or excess rainfall that are detrimental to performance of such animal.

The Semi-Intensive System

The animals are allowed to roam freely under natural conditions and feed themselves. The system suits the places with large area of land. There are two methods principally peculiar to semi-intensive: Fold unit and restricted range.

Fold Unit

The fold unit involves a low unit construction with the wire – mesh; wiring mesh also makes the two slanting sides. The whole unit can be

placed on a positive daily so that the animals can feed on the natural vegetation.

Restricted Range

This consists of a fixed building with a fenced pasture around the building. The pasture can be divided into three or four paddock so that animals can graze on the paddock rotationally.

Advantages of Semi- Intensive system

(i) Livestock have enough exercise to keep them healthy.
(ii) The system required less land.
(iii) Livestock obtained protective food from the range or pasture outside.
(iv) Livestock easily obtains vitamin-D through exposure to sunlight.
(v) There is complete protection from predators.
(vi) Crop-livestock interaction is employed.
(vii) The system prevents accumulation of parasites.

Disadvantages of Semi – Intensive system

(i) There is requirement for more labour to move the housing unit around.
(ii) The system entails huge capital to purchase materials and equipment for the livestock.
(iii) Diseases can spread easily when they are crowded together.

Summary

The systems of management of any type of livestock define the extent to which the animals are exposed to sunshine and pasture as well as the housing pattern. When the animals are fully exposed to sunshine and pasture the system is described as the extensive. When the animals are partially exposed the system is known as semi-intensive. When the animals are completely confined that there is little or no movement, the system is known as intensive.

Post – Test

1. Define intensive, extensive and semi – intensive system of livestock management.
2. What are the similarities and differences between extensive and the semi – intensive system of Livestock management?
3. Explain the intensive system of management in poultry.

References

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LECTURE THIRTEEN

Principles and Breeding of Livestock

Introduction

The principal aim of breeding is to obtain offsprings that would have high carcass value, produce more eggs or milk, have high prolificacy, and have high adaptive feature and immunity against diseases. Therefore there is a need for us to adequately have the knowledge and understand the principles revolving livestock breeding and genetics. Breeding may be carried out to produce animals with high sex libido, production of polled animals, and production of livestock with high feed conversion.

Objective

By the end of this lecture, students should be able to:

1. Define breeding.
2. State types of breeding.
3. Explain the principle of breeding.

Pre-Test

1. What is breeding?
2. List different types of breeding.

CONTENT

What is Breeding?

In simple language, breeding is the method or system or process of obtaining offsprings from a desired male and female parents. It is also the business of keeping animals for the purpose of producing new and improved kinds or young ones for sale or for further replacement of old stock.

Types of Breeding
The different types of breeding includes:

Inbreeding – The mating system in which the males and females mated to obtain the progeny that are closely related. Inbreeding reveals both desired and undesired traits.
The uses of inbreeding are:
(i) To form district lines or families with a breed
(ii) To develop inbred lines that can be used for crossing purposes to exploit hybrid vigor
(iii) To identify and cull undesirable recessive genes
(iv) To increase both homozygosity and prepotency
(v) To study the actual genetic worth of an animal by mating it to 24-35 of its own daughters

Outbreeding -This is a breed system in which individuals, less related than the average of the population to which they belong are mated. For all practical purposes, a mating can be considered out breeding if the individuals involved do not have a common ancestor in the preceding first 4-6 generations. This system of breeding can involve mating of unrelated animals within a breed (out crossing) crossing of inbred line grading up of scrubs crossing animals of different breeds (crossbreeding) and species hybridization in which animals of two related species are bred.

Breeding in Pigs
Gilts should be at least 8 months old before they are bred and boars be over 8 months old before they are used for breeding.

(a) Features to consider in selecting Female for Breeding
(i) The number of functional teats.
(ii) Lack of obesity
(iii) Good temperament.
(iv) Absence of abnormalities.

(b) Features to consider in selecting male for Breeding
(i) Well-developed and suspended testes.
(ii) Aggressiveness.

(c) Activities prior to Breeding
(i) Deworming and spraying of gilt and sows about two weeks prior to breeding is recommended.

(ii) Sanitary measures should be followed there after to prevent re-infection.

(iii) Flushing should also be implemented 10 to 15 days before breeding. Flushing must be maintained throughout the breeding period but not exceeding 28 days. Flushing is a technique by which the feed in take of high plane of nutrition of a female animal is increased so as to increase the ovulation and thereby increasing fertilized ova.

(d) Mating Sow Gilt

It has been observed that female pigs are highly fertile during mid oestrum i.e.35 to 48 hours after appearance of ovulation. It is then expedient and practicable to serve such pigs two times. First and second service should be carried out at 12 and 36 hours after the onset of ovulation respectively. For a proper record and to ensure the farrowing date, the sows should be taken to the boar when on heat for mating.

(e) Gestating Sow

The gestation period will normally last for 3 months, 3weeks and 3 days (114days). If possible, permit the animals into the pastures for good exercise and to obtain good quality protein and minerals from the forages consumed. A high plane of nutrition with 15-20% crude protein should be made available. The essence of such feed formulation and supply is to ensure better development of the reproductive tract for farrowing of large healthy litters, good supply of nutrition to the embryo, maintains strength of the mother at farrowing aids secretion of enough milk during lactation. It also improves optimum vigor and weight of pig let at weaning time.

Breeding in Goats and Sheep

The female (doe or ewe) animals that mature at 9 to 12 months of age are mated while the males (buck or ram) should be about 1.5 to 2years old before they are used for breeding. All the female animals should be exposed to a rigid plan of nutrition, a process referred to as plan of nutrition, a process referred to as flushing in preparation for pregnancy. Flushing stimulates the number of ova shed. The heat period is all the year round although it occurs more in some periods depending on the season. The heat period lasts for 1 or 2 days and occurs every 18 to 21 days. Animals that show signs heat are mated about twelve hours following the on – set of heat period by flock or stud mating. One buck or ram (male) is usually allotted to mate about forty does or ewes (female). In controlled

and intensive conditions, hand serving can increase the number of does or ewes to fifty or more.

During the gestation period, which is about 145 to 150 days, pregnant animals should be properly fed and allowed to exercise. Good feeding produces good factual development, good development of under tissue and ensures high milk yield.

Selection

Selection is the main tool employed in breeding of livestock. It is defined as a procedure in which certain individual animals in a population are included for becoming the parents of the next generation or are excluded by either culling or selling out to prevent them from becoming parents.

Selection is of two types, natural and artificial selection. Natural selection is the method used most by traditional farmers whereby achievement is detected in the progeny. Under artificial selection, the methods like mass, pedigree and progeny selection are utilized to obtain the desired traits.

Selection is imperative because a farmer chooses animals for breeding that have desirable characters, which are passed on to the offspring.

Management Practices to Improve Breeding Efficiency

1. Take and keep correct breeding record to include dates of heat service and parturition.
2. Routinely check and observe adult females and young females of breed able age and condition for heat at least once a day.
3. In large ruminant farms, use teaser makes for heat detection.
4. Know the complete breeding history of each female, her past performance and difficulties.
5. Invite the veterinarian to examine and treat females with abnormal discharges.
6. Attention of the veterinarian should be draw to examine in settled female after three services.
7. Check female animals for pregnancy at the proper time after breeding.
8. Purchase replacements from healthy herds and rest them before putting them in your herd.
9. Allow female to pastorate in isolation; clean it up and then in sterilize the area after expiration of parturition.

10. Practice a general sanitation programme.
11. Supply adequate nutrition.
12. Use the accurate technique of artificial insemination.
13. Provide adequate and suitable shelter management.

Summary

The aim of breeding is to obtain offspring from desired male and female parents. Inbreeding, a new and improved young ones are obtained which may invariably be used to replace the old or unproductive stock. Depending on the focus of the farmer, he may practice inbreeding or out breeding. The maintenance of sires in good condition suitable for breeding is a highly essential requirement for the success of breeding programmes. Both male and female marked out for breeding are to be exposed to adequate exercise and feeding.

Post –Test

1. Differentiate between inbreeding and out breeding.
2. Discuss breeding in pigs.
3. State management practices to improve breeding efficiency in farm animals.

Reference

Santry N.S.R. and Thomas C.K.(1976). *Farm Animal Management.* India: Vikas Publishing house PVT Ltd.

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LECTURE FOURTEEN

Livestock Judging

Introduction

Livestock judging has been a valuable method of unifying opinion on useful type and of indicating improvement opportunities. This can briefly be defined as the means of appraising the value of livestock for the purpose for which they are produced. The judging of merit in livestock is as fundamental to selection as selection is fundamental to improvement. Basic research studies are constantly seeking adjustment between production efficiency and economy values. Judging as a basis for selection and improvement in economic usefulness will grow in importance as basic research discoveries contribute to an improved understanding of the general agreement that is sought in useful type by the producer and the consumer.

Objective

By the end of the lecture, students should be able to define livestock judging and use specific terminologies to describe beef, dairy, breeding young and mature animals.

Pre –Test

1. What is livestock judging?
2. List five finishes and fleshing terms used to present reasons for placing classes of beef cattle.
3. Describe judging in swine.

CONTENT

Various terminologies are put in place in judging but relates to the kind of use the livestock is being put to This lecture will highlights on judging in beef, dairy, swine, mature breeding, immature breeding and young animals.

Judging In Beef Cattle

A. General impression

The following beef judging terms are used to present reason for placing classes of beef cattle. It is otherwise known as general impression.

1. A bull with excellent line.
2. Modern type.
3. Excellent type and well balanced
4. A big, growth muscular bull with tremendous spring rib and a thick top.
5. A big, stretchy heifer, but carrying excessive amount of condition.
6. Carrying uniform thickness from front to rear.
7. A very desirable beef type
8. Deep – bodied over finished.
9. Adequate depth with a minimum amount of outside cover.
10. Very "type" and smooth but definitely lacks some size and scale.
11. Very correct stretchy, muscular and correctly finished.
12. Very heavy boned and rugged for his age and extremely smooth and uniform in his finish.
13. Excellent balance
14. A big husky fellow.
15. Fitted to perfection.
16. A very neat trim well balance calf with a desirable amount of outside cover.
17. Very attractive straight – line calf indicating much promise for the future.
18. These calves are thick, meaty, evenly finished in their lines.
19. The modern type and loaded with red meat.
20. A stretcher steer that has more length from the hooks to the pins and is heavier muscle through the stifle and lower quarter
21. A cow possessing adequate size and scale.
22. He is an exceptionally long-bodied, trim fronted steer with a lot of class and is harder, firmer and more correct in the finish over his ribs back and loin and longer from the hooks the pins than any other steer in the class.
23. She is a neat well-balanced, stylish heifer.
24. A small headed individual.
25. She is evenly balanced and carries herself with ease.
26. A bull that takes a longer strides and move more true on his feet.

27. Strong and masculine about the head, neck, denoting breed type and sex character.
28. A bull of great size and scale combined with excellent muscling over ribs, backs and loin and down through the quarter.
29. A big rugged attractive heifer.

B. Heading and Breed character

Judging can also be made using head and breed character terms such as

1. A short thick, heavy neck.
2. Breedy – headed
3. Bold – headed.
4. Has an abundance of breed type.
5. The head denotes masculine sex characters.
6. Shows more Angus breed type and sex character about the head ears, and neck.
7. A more Alert-headed heifer (Bull or steer).
8. A wide head with moderately dished face.
9. Wide between the eyes and a broad muzzle.
10. A clean – cut moderately dished face with ample width.
11. Plain – headed heifer.

C. Forequarter Character

1. Neat and smooth about the shoulders.
2. A powerful front – ended bull or steer.
3. A broad clean – fronted bull with extreme muscle development through the arm and fore-arm region.
4. A narrow – chested individual.
5. Open – shouldered
6. Too narrow – fronted.
7. Full in the heart with excellent spring of ribs.
8. Neatly kid in back of the shoulder
9. Open and coarse over the top of the shoulder.
10. A bold – fronted bull very muscular through the arm and fore-arm area.

D. The Ribs, Loin, and the Back

Based on the morphological outlook of the rib back and loin, the following terms are also used in beef cattle judging:

1. Straight- lined, strong – topped individual.
2. More spread and thickness over the top.

3. Strong top.
4. Weak top.
5. Long – ribbed, strong – topped, long – loined steer.

E. Hindquarter

Like the forequarter terms, reasons can at times be put forward based on the hindquarter and are consequently referred to as hindquarter terms. Some of the terms are:

1. Extensively heavy – muscled through rear quarters.
2. Deep and fill in the twist indicating excessive fat deposits in the area.
3. Bulging rear quarters.
4. Neat at the tail.
5. Neatly lay at the tail head.

F. Legs and Bone Terminologies

1. A low – set, short – legged, light – boned heifer.
2. A move upstanding steer
3. A bull that is too short ledged and built to close to the ground.
4. Plenty of bones.
5. A straighter stronger – legged bull that strands on more substance of bone than any other animal in the class

G. Some Finish and Fleshing terms

1. Correct in his finish.
2. He is smoothly covered.
3. More uniform in his condition.
4. A harder, firmer, more uniform fat cover than any other steer in the class.
5. A soft flabby over-finished steer.

Judging in Dairy Cattle

Dairy cattle are judged by comparison. In comparative judging, one needs to have a mental picture of the ideal type animal and mentally compare the animals in the ring with this ideal. One need to be familiar with the scorecard of the ideal and you should make your selections by ranking the individuals composing the class in accordance with how closely they approach perfection.

Many breeders and some judges of all breeds have hold the opinion that all dairy cows have the same general conformation regardless of the breed hence the decision that all breeds should be judged by the standards

with the exception of strictly breed characters (colour, size and the head including horns).

Judging in Swine

Judging as said initially is applicable to all domestic livestock. Swine are also judged for the purpose of attaining an ideal market barrow. Ideal boar pig or ideal gilt should weigh around 80-100kg. Gilts and boars that are developed for breeding purposes should develop smoothness in the body, strength in the back sound feet and legs, outstanding muscling and excellent size and scale. Purebred gilt should show well-developed breed qualities such as the desirable colour and all the characteristics about head, ears etc. Gilts should not be too low in front since this will interferes with the smoothness in the arch.

Judging in Mature Breeding Animals

In mature sows, judging is somewhat easier to do because they are more fully developed than gilt. The mature sow should not carry a higher degree of finish than gilts. Mature sows should be judged on the length arch of top adequate depth smoothness.

Balance quality, good underpinning and breed character. In mature boars a well-developed top line, essential deep thick muscular hams, long, clean sides and neat are vital.

Summary

Livestock judging is a procedural method of measuring the worth of an animal for the ultimate purpose of its production. Livestock are appraised by general impression, head and breed character by forequarters the ribs loins and the back, hind quarters, legs and bones. However animals are especially judged by comparison.

Post – Test

1. List ten general impressions for judging beef cattle.
2. Briefly discuss judging in dairy cattle and swine.

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LECTURE FIFTEEN

Animal Conformation and Productivity

Introduction

The different species of animals we find on our farms and backyards today is the result of the efforts made by our forefathers to domesticate some out of the various species of animals that exist in the wild. Man's main occupation was hunting, and this was done aggressively to meet his food needs initially rather than for his protein intake. There is a change of attitude from this aggression the hunting man practised to a protective keeping of livestock species. Rather than hunt and kill, man has learnt to keep and preserve for multiplication of these livestock species. Some of the species that got domesticated include: the hoofed foot animals like sheep, goats, pigs and cattle, the dogs, the horses and the cats. The species of interest to us in this chapter will be the former group (the hoofed animals) and the avian species (the poultry birds).Over the years domestication has brought about a remarkable improvement in the productivity of the animals.

Objectives

At the end of the lecture students should be able to:

1. Name the different classes of farm animals.
2. Define and identify the members within each class of farm animal.
3. Explain the desired traits that characterize a good conformation in a named farm animal.
4. Interpret what a good conformation in farm animals are and how this relates to productivity.

Pre-Test

Carefully study these questions to give you insight to the course content.

1. What do you understand by classification of farm animals?
2. Can you differentiate between a class and a sub class?
3. Name the members within each class listed.
4. What do you understand by productivity?
5. Can you differentiate between a good conformation in a dairy, beef or work cattle?

CONTENT

A commonly used adage has it that "Beauty is in the eye of the beholder". This more or less applies to farm animals. For instance, a goat that looks robust and healthy when alive will definitely give a good yield of meat when slaughtered. Dairy cattle that have a heavy and full underside is a good indication of the capacity of such an animal to hold large quantity of feed, which will eventually be utilized for milk production.

Animal conformation therefore refers to the "proportionate shape or contour of an animal in relation to what it is expected to produce e.g. dairy cattle for milk, beef cattle for meat and layers for eggs.

Productivity is the quantity or power of producing especially in abundance.

Classification of Animals

Classification is divided into 2 main groups – the class and the sub-class.

(i) A class in a broad sense is the segregation of animals into groups on the basis of their commercial use. We have two classes
   a) The Slaughter class
   b) The Feeder class

The slaughter class refers to the group of farm animals that are physiologically mature and ready for slaughter. The feeder class on the other hand refers to animal which still have a capacity to grow and can be put in a finishing programme, this means given good food, management and a longer time, such animal can gain more weight and be heavier.

(ii) A sub-class refers to the set of animals within a class. It generally reflects the sex of the livestock.

Classes

1. Bovine refers to Cattle.
2. Ovine refers to Sheep.

3. Porcine refers to Pigs.
4. Equine refers to Horses.
5. Avian refers to Poultry.

1. Meat of the Bovine species is classified by age as beef, calf and veal. Beef is classified according to sex as steer, heifer, cow, bullock and bull.
   a) Steer – males castrated before sexual maturity.
   b) Heifer – young females or early stage of pregnancy.
   c) Cow – mature females that have calved.
   d) Bullock– young Bulls.
   e) Bulls – old Intact Males.
2. Ovine carcasses are classified according to age as mutton from sheep ore than two years old, and lamb from sheep less than one year old. Ovine carcasses may also be classified according to sex as rams, wethers or ewes.
   a) Wethers - a male ovine castrated before developing its secondary sexual characteristics.
   b) Ram - a male uncastrated ovine.
   c) Ewes - a female ovine.
   d) Lamb - an immature ovine, usually less than 14 months.
   e) Yearling - ovine between 1 to 2 years old, that has cut its permanent incisors.

In lambs no distinction is made between sexes.

3. Porcine are classified as: Barrow, gilt, sow, boar and stag. No age classification is used within the sex classification.
   a) Barrow - a male pig castrated while young.
   b) Boar - uncastrated male pig.
   c) Stag - a castrated male pig, after developing secondary sexual characteristics.
   d) Sow - mature female pig that has farrowed or in late Pregnancy.
   e) Gilt - a young female that never farrowed may be in first stage of pregnancy.

4. Caprine
   a) Buck - an intact male.
   b) Wether - a castrated male.
   c) Doe - female.

5. Equine

a) Stallion - an intact male.
b) Gelding - a castrated male.
c) Mare - a female.

Meat Grading

In the meat trade, we have what we refer to as "GRADE". The grade tells us exactly what type the animal is and relates what is in the life animal to what is got when slaughtered. So just like classification, meat grading helps to put meat of the same stage or degree together. Grading therefore is the segregation of units of a commodity or cuts into lots of grouping, which have a relatively high degree of uniformity in certain specified attributes, associated with market preferences.

We shall talk about meat grading in more details at a higher level, for now it might just be sufficient to know that beef is the most popularly consumed of meat types, it has two types of grading - Quality and yield grades.

1. Quality grades estimates the eating characteristics of meat– the two major criteria used in estimating quality grades are Maturity (as denoted by bone and colour of meat) and marbling referring to fat within the lean. We will tag this the 2 M's of quality grade. In other words we then can say quality of meat refers to those attributes that affect the eating satisfaction, composition and appearance of meat.
2. Yield grade simply put refers to the quantity of meat obtained from a carcass. A large animal is expected to give a better yield than a small animal.

What then is marbling? It is the primary determinant of carcass quality grade. When a chunk of meat is put on the table, it is usual to see traces of fat lines between the muscle fibres, these intramuscular fat streaks are what is referred to as marbling. It normally improves flavour and juiciness and sometimes has a little beneficial effect on tenderness. Excessive marbling however may cause the meat to have a greasy taste.

The other type of fat in meat is called extramuscular fat – more often than not, this is trimmed off before the meat is processed. This fat differs from intramuscular fat and does not add to its value or juiciness but could render it unattractive if not removed.

Superior or Inferior Conformation in Farm Animals

Conformation concerns differences in shape of various body parts and is usually evaluated by visual appraisal. It is believed that animals that gain weight rapidly and efficiently would cut out a high percentage of quality

meat. Good performance comes in many sizes and shapes. Therefore conformation serves as an indicator of development that has taken place in the animal.

A. **Meat Animals**: This is raised for meat. Emphasis is placed on estimating the ratio of lean meat or muscle to bone ratio and the ratio of the more demanded to the less preferred parts.

Good Conformation for (Beef Cattle)

i. Animal should have a blocky conformation characterised by short thick legs, long broad backs and full square rumps (which is an evidence of good muscling on the back part).
ii. Animal should have a deep wide and full quarter the longissimus dorsi is an indication of plenty meat on the thigh muscle.
iii. A pig with a good conformation has gently arched back and from the hind parts a gentle curvature. The back fat should be moderate.

The actual thickness and plumpness of the animal is influenced gently by the fatness of the animal. This trait therefore can best be appraised from those parts of the animal on which relatively little fat is deposited, for example.

a. The round in beef cattle.
b. The ham in pigs.
c. The leg in sheep and goats.

Inferior conformation includes:

a) Lack of thickness and fullness.
b) Various parts are angular or sunken.
c) Animal is narrow and thin.

B. **Dairy Animals**

A dairy cattle is expected to produce milk in abundance and ultimately meat at the end of its life. These traits unlike beef cattle cannot be visually evaluated. Milk production is a hidden trait unlike the usual parameters used to judge a work or beef cattle. The average conformation of a milking cow should include all or some of the following. Our tropical example of a milking cow is the White Fulani. A dairy cow is greatly angular especially at the hip bone. There's concavity at the junction of loin and flank. A heavy and full underside reflects capacity to hold large quantity of feed. Well formed and developed udder: udder must be strongly attached, well balanced, capacious udder of fine texture indicating heavy production and a long

period of usefulness. Well developed milk vein. Animal should be placid not aggressive in disposition, size and placement as the test is important for ease in milking.

Work Animals

Though the general trend has been towards mechanization, in today's world much of the agricultural power in many parts of the world are still provided by animals. Conditions that have militated against the rapid universal adoption of mechanization particularly in developing countries include small farms, scattered holdings, low economics levels, abundance of manpower insufficient capital, lack of servicing facilities.

The animal usually used for draft purposes are the horses and oxens (*Bos taurus* and *Bos indicus*). The draft horse body conformation differs from light horses in that a relatively larger proportion of the animals' total weight rests on the fore limbs because of a deeper and wider neck and greater depth of body.

The desirable characteristics for draft animals as described by W. Dinsmore (1935) for horses are:

1. A strong heavily-muscled back which seems short.
2. A short, wide, strong, heavily muscled loin.
3. A deep chest, wide through from side to side.
4. A roomy middle due to long, well sprung ribs and a capacious abdominal region.
5. Well-set legs, pasterns and feet, they should be correct in position, viewed from front, side or rear.
6. Strong leg joints, deep from front to rear that are clearly defined with dense bone of good quality.
7. Straight action and good wind (normal respiration).
8. Good head and eyes.
9. Good temper, which includes a tractable disposition intelligence, and lack of viciousness.

Undesirable characteristics for draft animals include:

1. Defects in conformation of the feet such as: corns, contacted feet, ring bones, laminitis and quarter cracks are a few examples of blemishes or unsoundness of the feet.
2. Defects in conformation of the leg such as splints, stifled condition, bone sprain and curbs.

In conclusion, it is good to know that a good work animal should have a large and healthy frame, great strength, ability to move easily, quiet temperament, docility and calmness under a variety of disturbing situations. The undesired traits include: A small and thin frame, a weak animal, inability to move well due to deformation or injury and an aggressive and restless animal that is difficult to control.

Summary

In this lecture you have learnt about the different classes of farm animals and what the members within each class stand for. You have also learnt about the good and bad conformation for farm animals used for meat, dairy and draft. You can also classify animals according to their sex and types.

Post-Test

1. Discuss the ideal and the undesirable types of conformation in beef cattle and any other livestock that you know.
2. Mention 5 classes in the classification of farm animals.

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LECTURE SIXTEEN

Livestock Products

Introduction

In the previous lecture, we learnt about livestock species that are commonly talked about. In this chapter, we will discuss the products obtainable from this different species of livestock. The different products from livestock include: meat products from the carcass or flesh of the animal, dairy products from milk, and eggs from poultry birds. Some of the products we'll talk about are directly edible while some are inedible or need to be subject to some form of processing before they could be termed useful.

Let me also point out that it is very important to be able to differentiate between this edible and inedible by products and to have their uses at your finger tips be it at home, in the industries or in the Agricultural set up.

Objectives

At the end of this lecture, students should be able to:

1. Name the different livestock products we have.
2. Differentiate between raw and processed meat products.
3. Explain the difference between animal products and animal by-products.

Pre-Test

These questions will give you an insight to what you are expected to learn in the class.

1. Write short notes on fresh and processed meats.
2. List the edible by-products and their uses.

3. Of what importance are the inedible by-products from animals to man?

CONTENT

Meat and Meat Products

Meat can be fresh, processed or can be meat by products (edible and inedible). Meat can be defined as anything that is derived from the flesh of an animal or an Animal tissue that is suitable for food. The meat types include:

Red Meat - The red meat types are beef, pork, lamb, processed products like cured bacon, ham or sausage.

White/Lean Meat - Sea foods, poultry, rabbit meat.

a) Fresh Meat: This is meat as obtained from the fresh carcass. It has not been subjected to any form of Processing or treatment that will affect its characteristic odour, flavour, colour, texture, taste or overall acceptability. The red colouration noted in meat is due to the presence of myoglobin in the muscle.

b) Processed Meat: This is meat that has been subjected to some form of treatment or processing so as to affect either all or some of the characteristic physical structure of odour, colour, flavour, taste and overall acceptability.

Why do we process meat? Processed meat removes the monotony associated with eating fresh meat since they introduce variety into the form in which fresh meat can be eaten. Examples are cured meats, smoked meats, sausages and specialty meats.

(i) **Cured Meats:** Meat curing is the application of salt, colour fixing ingredients, and seasonings to meat in order to impart unique properties to the end product. Originally, cured meat products were prepared by addition of salt at very high concentrations to preserve the meat. It functions basically to reduce the amount of water available for microbial growth. Examples are cured ham, bacon slab, and corned beef. These have curing salts like common salt, Sodium nitrite ($NaNO_2$), Sodium nitrate ($NaNO_3$), sugar etc added to the meat to have its characteristic flavour and colour of the meat changed.

(ii) **Smoked Meats** Are meats that have been exposed to wood smoke at some point in time during its manufacture. The main reasons for smoking meats today is the development of specific flavours and the

improvement of appearance. They are meats that have been cured and smoked. Examples are Smoked ham, Smoked Sliced bacon and smoked pork belly (Unam Inong). The smoke and heat have a drying bacteriostatic and bacteriocidal effects on the smoked products. However, in most present day processed meats, smoking contributes little if any preservative action, since it is done just to impart the smoky flavour.

(iii) **Sausages**: Sausage is a food that is prepared from comminuted and seasoned meat, it is usually formed into a symmetrical shape, and the word hails from a Latin word SALSUS meaning salted. Simply put therefore sausages are made from minced or ground meat, usually seasoned with salt and stuffed into a casing. There are different kinds of sausages.

(a) Fresh Sausages — Examples of these are — Fresh Pork Sausage and Fresh Beef Sausages.

(b) Cooked and canned ready to eat sausages — this can be warmed or heated with the microwave oven. Examples are: Frankfurters/Hot dogs; blood sausage, Head cheese, Bologna, Braunschweiger.

(iv) **Variety Meat**: These are edible meat by-products obtained during the slaughter and processing of meat animals. They include items such as tongue, brains, heart, sweetbreads, liver, kidney, lungs and tripe. Others are udder meats, ox lips, cowlegs and weasand meat (cattle oesophagus).

(v) **Specialty Meats**: These are meats from special parts of the carcass or organ meats treated specially. For example, the tongue could be thoroughly washed, then cooked, pickled, or smoked. Meat could be blended or minced to give luncheon meat, meat loaf or minced meat — these all have characteristics of fresh meat. Emulsion meat is meat that has lost the characteristics of fresh meat due to the fact that it has been ground, or blended, spices or condiments have been added and such is ready to be used as a unit in food preparation.

Dairy Products

Milk is secreted by the mammary glands of mammals as the first food for the young. It is said to be a palatable, refreshing, nutritious, safe, economical and convenient food. Products obtained from these include cheese, cultured products, butter, Ice-cream and ingredients in home and commercially prepared foods.

Milk contains all the nutrients necessary to promote and maintain life. It is therefore a protective food. The average composition of milk on the farm production basis is 87.69% water, 3.28% protein, 3.66% total lipids (fat); *4.65%* carbohydrate (lactose) and 0.72% ash (salts).

Milk proteins are principally in 2 classes 1) Casein and 2) Whey Proteins (Whitney et al, 1976). When milk coagulates, casein precipitates and is the principal protein in the curd. The whey (yellowish fluid that separates from the curd) contains proteins that are not precipitated with the casein, which is called whey or serum proteins. Therefore casein makes up 78 — *85%* of the proteins in milk.

Fresh Milk

This can be processed into whole milk, skimmed milk (contains 0.5 — *2.5%* butter fat) and full cream milk (contains 18 — 36% fat).Fresh milk is pasteurized to make it safe for consumption. We have 2 types of pasteurization.

HTST => High temp, short time pasteurization [71.7^{0}c '15 seconds]

LTLT => Low temp, long-time pasteurization [62.8^{0}c '30 minutes]

Manufactured dairy products include:

(i) Homogenized milk
(ii) Pasteurized/sterilized milk
(iii) Non fat dryed milk
(iv) Condensed milk
(v) Lactose or milk sugar
(vi) Creamery butter
(vii) Cheese -800 or more types
Hard - cheddar cheese
Soft - cottage cheese
(viii) Milk powder
(ix) Butter milk
(x) Yoghourt
(xi) Whey protein
(xii) Casein

Cultured Products

Fermentation product by selected types of bacteria and yeasts.

-Cultured butter milk
-Yoghurt or yogurt

Flavour and colour result from the chemical changes in lactose, protein and fat caused by the microorganism.

Frozen Dairy Products

Ice cream, Ice milk, Sherbet.

Butter-This is fat separated from milk by centrifugation. The fat is then churned to form butter with butter milk as by-product.

Poultry Products

Eggs are high in food value and are especially valuable for the health of infants, children as well as for the infirm and aged. Eggs are an excellent source of high quality proteins and substantial quantities of most vitamins except vitamin C. We therefore can say that it is one of nature's most complete foods.

In the processing of eggs, it should be noted that eggs in the shell (or shell eggs as they are usually called) are similar to fresh fruits and vegetables and therefore should be handled with care. The following could be got from egg product.

(i) Shell eggs
(ii) Egg white
(iii) Egg yolk
(iv) Whole egg-Fortified with extra yolk blended with other ingredients.
(v) Sugared yolk -Sucrose or corn starch added (Bird's custard).
(vi) Salted yolk
(vii) Pasteurized eggs
(viii) Frozen egg
(ix) Dried egg
(x) Egg roll

Percentage of Gross Chemical Composition of Hen's Egg

Compound	Shell (with membranes)	Albumen	Yolk
Water	2.5	88.1	48.8
Protein	6.4	10.1	16.4
Lipid	0	0	32.9
Other organic constituents	0	1.2	0.2
Inorganic compounds	91.1[a]	0.6	1.7
TOTAL	100.0	100.0	100.0

[a] Mainly $CaCO_3$ — Calcium carbonate

Brant (1980). Poultry products: Eggs and Meat

Animal By-Products

Animal by-products include everything of economic value, other than the carcass obtained from an animal during slaughter and processing. These products are classified as either being edible or inedible based on whether or not they are intended for human food.

A. **Edible By-Products and their Uses**

Raw by-product	Principal use
- Brains, Heart, Kidneys, Liver, Spleen (Melt), sweet breads, Tongue	Variety meat
- Ox tails	Soup stock
- Cheek & head trinlmings	Sausage ingredients
- Beef extract	Soups and bouillion
- Blood	Sausage component
Stomach	
Stomach of suckling calves	Rennet for cheese making
Stomach of pigs	Sausage container, sausage ingredient
Stomach of cow (1st and 2nd)	Sausage ingredients, variety meat (tripe)
Bones	Gelatin for confectioneries, Ice cream and jellied food products
Fats	
(a) Cattle, calves, lambs & sheep	Shortening candies, chewing gum shortening (lard)
(b) Pork	
Intestines, small	Sausage casing
Intestine, large (Pork)	Variety meat (chitterlings)
Intestines large	Sausage casings
Esophagus (weasand)	Sausage ingredients
Pork skins	Gelatin for confectioneries, Ice cream, and jellied food products; French fried pork skins.

B. Inedible By-Products from Animals and Their Major Usages

Raw by product	Processed by products	Use
Hide (cattle calves) Paper boxes, sand	Leather Paper, plywood, sizing	Glue
Pork Skins	Tanned skin	Leather goods
Pelts	Wool	Textiles
Skin	Leather goods	
Fats'	Lanolin	Ointments
Hair	Felts	Plaster binder, upholstery
Cattle, calves, lambs and sheep	Inedible tallow (titer value) 40oc	Industrial oil, lubricants, soap, glycerine
Cattle, calves, lambs, sheep, hops	Tankage cracklings stick	Livestock and poultry feeds
Hogs	Grease industrial oils	Animal feeds, soap
Bones	Dry bone	Glue, hardening steel, refining, sugar (bone charcoal)
	Bone meal	Animal feed, fertilizer
	Blood albumen	Leather preparations textile sizing
Cattle feet	Neats foot stock Neats foot oil	Fine lubricants Leather preparation
Glands	Pharmaceuticals Enzymes preparations	Medicines, industrial uses
Lungs (all species)		Pet foods

From Forrest et al. (1975)

Here are some notes to understand the tables above.

- Hides & skins - These are technically divided into hides, kips and skins.
  Hides come from large & mature animals.
  Kips are the skins of immature animals.
  Skins are from small animals like calves.
- Tallows and Greases: Most sheep and cattle fats are tallow pork. Fat is classified as grease. Fat having a titer value above 4O°c is fallow while below 40cc is classified as fat.
- Glycerine and fatty acids.
  Glycerine is used in manufacturing of pharmaceuticals, explosives, cosmetics, transparent wrapping materials paints etc.

Fatty acid are used in the manufacture of soaps and detergents, wetting agents, insecticides & herbicides, cutting oils, paints, lubricants, and as additives to asphalt. The feed industry utilizes stabilized inedible tallows & greases to mix feed. It makes feedstuffs less dusty, more palatable and facilitates the pelleting process. They also add energy to the feed.

By-Products in Feed

(1) Blood meal: fresh blood is coagulated with stream, draining of the liquid and drying the coagulum. This dried blood is rich in protein, it is used extensively in feed formulation add in commercial feed operations.

(2) Meat meal: rejected non-toxic carcass can be dried and mixed with feed organ such as live are also used.

(3) Bone meal: Cooking bone with steam under high pressure in order to remove any fat & meat left in them. Dried bone is ground and used as calcium & phosphorous supplement in feeds.

Feather meal: plucked feather is hydrolyzed in steam and used in livestock feeds.

Tankage: The gut is boiled and dried; this is included in the feed.

Some important uses of tissues and organs to man

Bone: When this is purified it is used as a source of calcium & phosphorus in pediatric foods.

Intestine: The small intestine of sheep is made into surgical ligatures for suturing internal incisions or wounds. This consist mainly just collagen, which the enzymes of the body eventually digest.

Liver: Live extracts are used in treating pernicious anemia - the isolation and synthesis of vitamin B12 from liver is phasing this out.

Lungs: Heparin is obtained from lungs or liver and is used as an anticoagulant to prevent blood clots.

Spinal cord: Cattle is a source of cholesterol, whose principal use is in the preparation of Vitamin D.

Stomach: Rennet from calve stomach is used to curdle milk in cheese making process.

This rennet enzyme can be added to the diets of infants to aid in their digestion of milk.

Mucin from pig stomach is used in the treatment of ulcers.

Pepsin from pig stomach was used as an aid to digestion.

All these illustrate the importance of animals and the meat packing industry to our health and well being.

Summary

In this chapter we have dealt extensively with different livestock products such as meat and meat products, milk and dairy products, Eggs and egg products. All these are products meant for direct consumption by man.

Animal by-products differ in the sense that have economic value and may or may not be directly edible to man. The uses of animal by-products cut across the home, through the farm, the industries and the hospitals.

Post-Test

1. Differentiate between fresh and processed meat products.
2. Name the types of processed meat you know.
3. Discuss the various by-products associated with the meat industry.

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