



# National Guidelines on Good Livestock Production Practices

Department of Livestock Services  
Ministry of Fisheries and Livestock  
Bangladesh

June 2023

## **The National Guidelines on Good Livestock Production Practices was developed by the U.S. Department of Agriculture Bangladesh Trade Facilitation project**

### Disclaimer:

This guideline was made possible by the generous support of the American people through the United States Department of Agriculture's Food for Progress Program. The contents are the responsibility of the author and the Bangladesh Trade Facilitation project and do not necessarily reflect the views of the United States Department of Agriculture or the United States Government.



The U.S. Department of Agriculture, Food for Progress program helps developing countries and emerging democracies modernize and strengthen their agricultural sectors. The objectives are to improve agricultural productivity and to expand the trade of food and agricultural products.

<https://www.fas.usda.gov/programs/food-progress>



Bangladesh Trade Facilitation Project supports the Government of Bangladesh and partners with industry stakeholders to expand and improve agricultural trade. The project supports the Government of Bangladesh to harmonize processes and formalities, reforming policies, improving the delivery of trade services, increasing transparency, and complying with the WTO Trade Facilitation Agreement.

## **I. EXECUTIVE SUMMARY**

The National Guidelines on Good Livestock Production Practices (NG-GLPP) are the guidelines that systemically describe the scientific and standard procedures of animal production practices for the owners of the animals and the managers of the animal farms to implement in the livestock and poultry farms for humane rearing and production of animals, ensuring safe and quality animal products, licensing the farms by the Department of Livestock Services (DLS), aiming to export of animal products and confirming successful and profitable operation of the animal rearing in Bangladesh. It is expected that these guidelines will provide stepwise duties and responsibilities of the animal owners/farm managers from establishment of animal farm including the backyard animal rearing facilities to the production of animal and their products, even to the marketing of them. Before starting the narration of the guidelines, the 'Present Animal Production Practices in Bangladesh' is highlighted and in comparison, the 'Present Animal Production Practices in the World' is shortly mentioned to understand the animal production scenario in Bangladesh in respect to that in the world. This comparison will allow the animal owners/farm managers to imagine and understand their position in the world in terms of animal production practices. Based on this background, knowledge thrusts and demands of the animal entrepreneurs, modern scientific management practices in animal rearing, consumers' expectations, public health and environmental issues, and finally the animal production practices that could be adaptable in Bangladesh, the NG-GLPP have been formulated. However, the guidelines have been described according to the rearing procedures of the domestic birds that is referred as 'Poultry', which includes chicken and duck (major poultry species in Bangladesh), and the domestic animals referred as 'Livestock', which includes cattle, buffalo, goat, sheep and pig. Poultry and livestock have combinedly been referred as 'Animal' in these guidelines.

After planning for rearing animals (livestock/poultry), one should identify and review his/her skills and competencies for rearing of a specific livestock or poultry species. An animal rearing entrepreneur can hire skill and competent manpower/professionals from inside and/or outside Bangladesh for establishment, operation and management of his/her enterprise depending on the size and extent of his/her enterprise. The backyard and smallholders' animal keepers can acquire or refresh their skills and competencies for animal rearing through getting hands on training, visiting and/or working in the existing animal enterprises and/or rearing facilities.

A number of components of animal farms and animal rearing facilities (backyard rearing facilities), such as, location of animal farm/rearing facility, layout of animal farm/rearing facility, animal housing and facilities, and selection of breed and individual animals for rearing are essential to establish an ideal animal farm/rearing facility for its successful and profitable operation, which have been outlined at the starting. Under the section 'Selection of Breed and Individual Animals for Rearing', the locally available breeds of the poultry (chicken and duck) and livestock (cattle, buffalo, goat, sheep and pig) are considered for discussion. The individual animals are also proposed to select from the locally available breeds. The selection of the poultry and livestock breeds has been proposed based on their production potentials and adaptability to the climatic condition of Bangladesh as per the National Livestock Development Policy, 2007 of Bangladesh according to the animal rearing systems, such as extensive, semi-intensive and intensive system. In the selection process of the individual animals from the proposed breed(s) of poultry and livestock, the selection criteria have been mentioned, by following which one can easily select his/her right and desired poultry and livestock for rearing.

In the section 'Sourcing of Animals', the process of procurement of the intended poultry and livestock has been described. One can procure his/her intended poultry or livestock and/or their breeding inputs (e.g., fertile eggs, day-old birds, semen, embryos etc.) of the locally available breeds from the local sources. The entrepreneur can also import the intended poultry or livestock and/or their breeding inputs of other breeds from the animal resource potential countries complying the Acts, Rules and Regulations of Bangladesh and the exporting countries.

After establishment of the infrastructure of an animal farm/rearing facility and getting the intended animals for rearing in the farm/facility, the next step will be the farm registration from the DLS according to the provisions of the 'Animal Disease Act, 2005' and 'Animal Disease Rule, 2008'. The registration procedures of different types of farms have been described in the respective chapter. Management and operation are the key events of the animal farm/facility. Keeping the situation in mind and considering the gradual transformation of traditional farming to modern livestock and poultry farming, latest technological practices in farm management considering local climatic conditions, the farm/facility management and operation cover the major part of the animal production practices, which have been commonly described for poultry and livestock: identification of

animals and traceability, feeds and nutrition management, animal health management, bio-security measures, hygiene and sanitation management, waste disposal and environment management, breeding, breeding practices and use of assisted reproductive technologies (ART), prevention and control of animal diseases, and other management practices. For poultry farming, breeder poultry flock and hatchery management, and commercial poultry flock management, and herds management, neonate and infant management, and post weaning young stock management for livestock farming have separately been described.

The DLS has been working for providing adequate, safe and quality animal protein (meat, milk and eggs) to the peoples since 1947. A satisfactory level of quantity and quality of animal products could be produced in animal farm/facilities following a good management and operation practices. A considerable quantity of the animal products is generally sold from the farm/facility as fresh product as such egg, milk and animals for meat. Unsold products require to be prepared and/or processed for further marketing, although some entrepreneurs process the products for value addition to be sold with a higher price and taking chance to store them for further marketing. Production, preparation, processing, preservation and marketing must follow the relevant provisions of food safety acts, rules and regulations. At present, food safety is a burning issue and the consumers are very much concern about the food safety and frequently shout more for the food safety than for their price. So, the production, preparation, processing, preservation and marketing of the animal products should follow the strict hygienic and sanitary measures, and the local and international codes of practices to provide safe and quality animal origin food to the consumers. The handling, preparation, processing and marketing of animal products and their food safety have been discussed under 'Animal Product Handling, Processing and Marketing, and Food Safety' chapter.

Animal welfare is another big concern in the modern world. The humane animal rearing, management and their production are the demand of the consumers as well as the animal welfare societies of the national and international levels. The owners, manager and workers of the animal farm/facility have the diverse responsibility for humane rearing, management and operation of the animal in their farm/facility that must comply with the Animal Welfare Act 2019 of Bangladesh. The animal owners/farm managers should also ensure the wellbeing of the workers and healthier work environment for them. The animal

owner/farm manager should keep all records of the farm/facility for correct and successful management of their business. The animal owner/farm manager should evaluate the existing management systems of the enterprise for their effectiveness and efficiency. If any management system or any component of a system does work properly in terms of correct management, operation and profitability of the livestock farm/facility, that must be efficiently reviewed, identified the issues and solved the problem for the ultimate profitability. All of these responsibilities should be efficiently shouldered by the animal owner/farm manager, and all these responsibilities including animal welfare have been presented under the section 'Animal Welfare, and Responsibilities of Animal Enterprises'.

Formulation and documentation of guidelines for a particular purpose are not enough to follow the guidelines. Any guideline document remains as a paper work only and does not have any importance to the target peoples until successfully implemented. Implementation of the documented guidelines is the prime step to follow the guidelines by the stakeholders. There should have some tools including the respective acts, rules and regulations for successful implementation of any directive like these guidelines. Bangladesh do have some tools like acts, rules and regulations that will help the authority in implementation of this NG-GLPP. Some recommendations on validation, approval and implementation of the guidelines have been mentioned elsewhere in the appendix. The validation process of the NG-GLPP has also been mentioned after the 'Resources' section. In the appendix, valuable information and data have been incorporated (some are as example) that may be helpful for successful and profitable operation and management of the livestock and poultry enterprises in Bangladesh.

Successful implementation of the NG-GLPP at the stakeholders' level is expected to be beneficial for profitable operation of the enterprises, increased production of quality animal products, ensured food safety and conservation of environment. Proper practices of the guidelines can also ensure registration of the enterprises by the DLS, quality certification of the animal products and boost export of animal and animal products. However, particular protocols and standard operating procedures (SOPs) for the particular management and operation of the enterprises should be formulated beyond the NG-GLPP to ensure the correct practices of the guidelines.

## II. CONTENTS

Chapter	Subject	Page No.
	<b>I. EXECUTIVE SUMMARY</b>	<b>i - iv</b>
	<b>II. CONTENTS</b>	<b>v - xvii</b>
	<b>III. ABBREVIATIONS</b>	<b>xviii - xix</b>
	<b>IV. RESOURCES</b>	<b>xx - xxviii</b>
	<b>V. Validation of the NG-GLPP</b>	<b>xxix - xxxi</b>
<b>CHAPTER I: GENERAL</b>		<b>1 - 5</b>
1.1.	Introduction	1 - 3
1.2.	Scope of the Guidelines	3
1.3.	Purpose of the Guidelines	4
1.4.	Definition of Terms	4 - 5
<b>CHAPTER II: PRESENT ANIMAL PRODUCTION PRACTICES IN BANGLADESH AND IN THE WORLD</b>		<b>6 - 9</b>
2.1.	Present Animal Production Practices in Bangladesh	6 - 8
2.1.1.	Farm Classification Based on Land Use and Animals Concentration	6 - 7
2.1.1.1.	Extensive Farming or Free-Range Farming System	6
2.1.1.2.	Semi-intensive Farming	6
2.1.1.3.	Intensive Farming	6 - 7
2.1.2.	Farm Classification Based on Nature and Purpose	7 - 8
2.1.2.1.	Backyard/Household System Animal Production	7
2.1.2.2.	Free Ranging Animal Production	7
2.1.2.3.	Farming System Animal Production	7 - 8
2.1.3.	Farm Classification as per the DLS Definition	8
2.2.	Present Animal Production Practices in The World	9
2.2.1.	Land-Based Animal Production System	9
2.2.2.	Mixed-Farming Animal Production System	9
2.2.3.	Feedlot System	9
2.2.4.	Backyard Animal Production System	9
2.2.4.1.	Semi-Commercial Animal Production System	9
2.2.4.2.	Commercial Animal Production System	9
<b>NATIONAL GUIDELINES ON GOOD LIVESTOCK PRODUCTION PRACTICES (NG-GLPP)</b>		<b>10 - 234</b>
<b>CHAPTER III: REQUIREMENTS OF ANIMAL OWNER/FARM MANAGER/WORKER AND COMPONENTS OF ANIMAL FARM/ANIMAL REARING FACILITY</b>		<b>10 - 18</b>
3.1.	Skills and Competencies Required for Animal Owner/Farm Manager/Worker	10
3.2.	Components of Animal Farm/Animal Rearing Facility	11 - 18
3.2.1.	Location of Farm/Animal Rearing Facility	11

Chapter	Subject	Page No.
	3.2.2. Layout of Farm/Animal Rearing Facility	11 - 12
	3.2.3. Animal Housing and Housing Facilities	12 - 18
	3.2.3.1. General Guidelines	12 - 14
	3.2.3.1.1. <i>Animal Housing</i>	12 - 13
	3.2.3.1.2. <i>Housing Facilities</i>	14
	3.2.3.1.3. <i>Materials to be Used for Animal Housing and Housing Facilities</i>	14
	3.2.3.2. Poultry Farms/Poultry Rearing Facilities	14 - 16
	3.2.3.2.1. <i>Poultry Housing</i>	15
	3.2.3.2.2. <i>Poultry Housing Facilities</i>	15 - 16
	A. Specific for Ducks	15 - 16
	3.2.3.3. Livestock Farms/Livestock Rearing Facilities	16 - 18
	3.2.3.3.1. <i>Livestock Housing</i>	17
	3.2.3.3.2. <i>Livestock Housing Facilities</i>	17 - 18
<b>CHAPTER IV: SELECTION OF BREEDS AND INDIVIDUAL ANIMALS FOR REARING</b>		<b>19 - 40</b>
4.1.	Selection of Breeds and Individual Animals for Rearing	19
4.1.1.	Poultry	19 - 26
4.1.1.1.	Chicken	19 - 23
4.1.1.1.1.	<i>Selection of Chicken Breeds for Rearing</i>	19 - 21
4.1.1.1.2.	<i>Selection of Day-Old Chicks (DOC) and Replacement Pullets for Rearing</i>	21 - 23
A.	Day-old Chick (DOC)	21 - 22
B.	Replacement Pullets	22 - 23
4.1.1.2.	Duck	23 - 26
4.1.1.2.1.	<i>Selection of Duck Breeds for Rearing</i>	23 - 24
4.1.1.2.2.	<i>Selection of Day-old Duckling (DOD) and Mature Duck before Laying for Rearing</i>	24 - 26
A.	Day-old Duckling (DOD)	24 - 25
B.	Mature Duck before Laying	25 - 26
4.1.2.	Livestock	26 - 39
4.1.2.1.	Cattle	26 - 33
4.1.2.1.1.	<i>Selection of Cattle Breeds for Rearing</i>	26 - 28
4.1.2.1.2.	<i>Selection of Cattle for Rearing</i>	29 - 33
A.	Dairy Cattle (Cow and Replacement Heifer)	29 - 31
A.1.	<i>Physical Characteristics</i>	29 - 30
A.2.	<i>Reproductive Characteristics</i>	31
A.3.	<i>Milk Production Characteristics</i>	31

Chapter	Subject	Page No.
	B. Beef Cattle (Bull Calf, Bull and Bullock)	32 - 33
	<i>B.1. Physical Characteristics</i>	32 - 33
	<i>B.2. Performance characteristics</i>	33
4.1.2.2.	Buffalo	33 - 34
	<i>4.1.2.2.1. Selection of Buffalo Breeds for Rearing</i>	33 - 34
	<i>4.1.2.2.2. Selection of Buffalo for Rearing</i>	34
4.1.2.3.	Goat	35 - 36
	<i>4.1.2.3.1. Selection of Goat Breeds for Rearing</i>	35
	<i>4.1.2.3.2. Selection of Goat for Rearing</i>	36
	A. Selection of Does and Doeling for Rearing	36
	B. Selection of Wether (Castrated Buck) for Rearing	36
4.1.2.4.	Sheep	37 - 38
	<i>4.1.2.4.1. Selection of Sheep Breeds for Rearing</i>	37
	<i>4.1.2.4.2. Selection of Sheep for Rearing</i>	37 - 38
	A. Selection of Ewes/Ewe Lambs for Rearing	37
	B. Selection of Wether (Castrated Ram) for Rearing	38
4.1.2.5.	Pig	38 - 39
	<i>4.1.2.5.1. Selection of Pig Breeds for Rearing</i>	38
	<i>4.1.2.5.2. Selection of Pig for Rearing</i>	38 - 39
	A. Selection Criteria of Pig (Sow, Gilt, Boar and Barrow) for Rearing	38 - 39
4.2.	Sourcing of Animals	39 - 40
	4.2.1. Poultry	39 - 40
	4.2.2. Livestock	40
<b>CHAPTER V: REGISTRATION OF LIVESTOCK AND POULTRY FARMS</b>		<b>41 - 44</b>
5.1.	Registration of Livestock and Poultry Farms	41 - 44
	5.1.1. Registration of Grand-Grand/Grand Parent (GGP/GP) Stock Poultry Farm	42
	5.1.2. Registration of Parent Stock (PS)/Commercial Poultry (CP) Farm	42
	5.1.3. Registration of Commercial Ruminant's Farm Including Cattle/Buffalo/Goat/Sheep	43 - 44
<b>CHAPTER VI: GENERAL FARM MANAGEMENT</b>		<b>45 - 67</b>
6.1.	Characteristics of A Modern Animal Farm	45 - 46
6.2.	Animal Identification and Traceability	46 - 55

Chapter	Subject	Page No.
6.2.1.	Benefits of Animal Identification and Traceability	46 - 47
6.2.2.	Animal Identification	47 - 53
6.2.2.1.	Methods of Animal Identification	47 - 52
6.2.2.1.1.	<i>Livestock</i>	47 - 49
	A. Conventional Methods	47 - 48
	B. Biometric Methods	48
	C. Electronic Methods	49
6.2.2.1.2.	<i>Poultry</i>	50 - 52
	A. Conventional Methods	50 - 51
	B. Electronic Methods	52
6.2.3.	Traceability	52 - 55
6.2.3.1.	Animal Traceability	53 - 55
6.3.	Feed and Nutrition Management	55 - 58
6.3.1.	Poultry	55 - 57
6.3.2.	Livestock	57 - 58
6.4.	Animal Health Management	58 - 61
6.4.1.	General Guidelines	58
6.4.2.	Introduction of New Stock	58
6.4.3.	Surveillance and Control of Diseases	59
6.4.4.	Protocols When Disease Is Suspected	59
6.4.5.	Laboratory Testing	60
6.4.6.	Drugs, Medicine and Biologics (Vaccines Etc.)	60
6.4.7.	Prevention and Treatment	60
6.4.8.	Record Keeping of Animal Health Management	61
6.5.	Bio-security Measures	62 - 64
6.6.	Hygiene and Sanitation Management	64 - 66
6.6.1.	Hygiene management	64 - 65
6.6.1.1.	Personal Hygiene	64
6.6.1.2.	General Farm Hygiene	65
6.6.2.	Sanitation Management	65 - 66
6.6.2.1.	Pest Control Program	66
6.7.	Waste Disposal and Environment Management	67
6.7.1.	Waste Disposal	67
6.7.2.	Environment Management	67
<b>CHAPTER VII: BREEDING, BREEDING PRACTICES AND USE OF ART</b>		<b>68 - 95</b>
7.1.	Breeding of Animals	68 - 74
7.1.1.	Poultry	68 - 70

Chapter	Subject	Page No.
	7.1.1.1. Chicken	68 - 69
	7.1.1.1.1. <i>Chicken for Egg</i>	68
	7.1.1.1.2. <i>Chicken for Meat</i>	69
	7.1.1.2. Duck	69 - 70
	7.1.1.2.1. <i>Duck for Egg</i>	69
	7.1.1.2.2. <i>Duck for Meat</i>	70
7.1.2.	Livestock	70 - 74
	7.1.2.1. Cattle	70 - 72
	7.1.2.1.1. <i>Cattle for More Milk</i>	70 - 71
	7.1.2.1.2. <i>Cattle for More Meat</i>	72
	7.1.2.2. Buffalo	72 - 73
	7.1.2.2.1. <i>Buffalo for More Milk</i>	72 - 73
	7.1.2.3. Goat	73
	7.1.2.3.1. <i>Goat for More Meat</i>	73
	7.1.2.4. Sheep	74
	7.1.2.4.1. <i>Sheep for More Meat</i>	74
	7.1.2.4. Pig	74
7.2.	Breeding Practices	74 - 91
	7.2.1. Breeding methods	74 - 75
	7.2.2. Poultry	76 - 78
	7.2.2.1. Chicken	76 - 77
	7.2.2.1.1. <i>Selection Criteria of Breeder Chicken (Both Layer and Broiler)</i>	76 - 77
	7.2.2.1.2. <i>Selection Criteria of Layer Breeder Chicken</i>	77
	7.2.2.1.3. <i>Selection Criteria of Broiler Breeder Chicken</i>	77
	7.2.2.1.4. <i>Mating/Breeding of Chicken</i>	77
	7.2.2.2. Duck	78
	7.2.2.2.1. <i>Selection Criteria of Breeder Duck (Duck and Drake)</i>	78
	7.2.2.2.2. <i>Mating/Breeding of Ducks</i>	78
7.2.3.	Livestock	78 - 91
	7.2.3.1. Cattle (Cow/Heifer)	78 - 81
	7.2.3.1.1. <i>Selection Criteria of Cows/Heifers for Breeding</i>	78
	7.2.3.1.2. <i>Estrus (Heat) Signs and Estrus Detection in Cows/Heifers</i>	79
	7.2.3.1.3. <i>Estrus Detection in Cows/Heifers</i>	80
	7.2.3.1.4. <i>Breeding/Insemination of Cows/Heifers</i>	81

Chapter	Subject	Page No.
	7.2.3.2. Buffalo (Buffalo cow/Heifer buffalo)	81 - 84
	7.2.3.2.1. <i>Selection Criteria of Buffalo Cows/Heifer Buffaloes for Breeding</i>	81
	7.2.3.2.2. <i>Heat (Estrus) Signs of Buffalo Cows/Heifer Buffaloes</i>	81 - 82
	7.2.3.2.3. <i>Estrus Detection in Buffalo Cows/Heifer Buffaloes</i>	82
	7.2.3.2.4. <i>Breeding of Buffalo Cows/Heifer Buffaloes</i>	83
	7.2.3.3. Breeding Management of Cattle and Buffalo	83 - 84
	7.2.3.4. Goat (Doe/Doeling) and Sheep (Ewe/Ewe lamb)	84 - 88
	7.2.3.4.1. <i>Selection Criteria of Doe/Doeling and Ewe/Ewe Lambs for Breeding</i>	84
	7.2.3.4.2. <i>Selection Criteria of Buck/Ram for Breeding</i>	84 - 85
	7.2.3.4.3. <i>Estrous (Heat) Signs of Goat and Sheep</i>	85
	7.2.3.4.4. <i>Male Activities with Estrous Female</i>	85
	7.2.3.4.5. <i>Estrus/Heat Detection in Goat and Sheep</i>	86
	7.2.3.4.6. <i>Mating/Breeding of Goat and Sheep</i>	86
	7.2.3.4.7. <i>Breeding Management of Does/Doelings and Ewes/Ewe Lambs</i>	86 - 88
	7.2.3.5. Pig (Sow/Gilt)	88 - 91
	7.2.3.5.1. <i>Selection Criteria of Sow/Gilt for Breeding</i>	88
	7.2.3.5.2. <i>Selection Criteria of Boar for Breeding</i>	88 - 89
	7.2.3.5.3. <i>Estrous Signs of Sow/Gilt</i>	89
	7.2.3.5.4. <i>Estrus Detection of Sows/Gilts</i>	89
	7.2.3.5.5. <i>Mating/Breeding of Sow/Gilt</i>	89 - 90
	7.2.3.5.6. <i>Breeding Management of Sows/Gilts</i>	90 - 91
7.3.	Use of Assisted Reproductive Technologies (ART) in Animal Reproduction	91 - 95
7.3.1.	Poultry	92 - 93
7.3.1.1.	Semen Collection from Poultry	93
7.3.1.2.	Artificial Insemination (AI) in Poultry	93
7.3.2.	Livestock	93 - 95
7.3.2.1.	Semen Cryopreservation and AI	94 - 95
7.3.2.1.1.	<i>Cryopreservation of Livestock Semen</i>	94 - 95
7.3.2.1.2.	<i>Artificial Insemination (AI) in Livestock</i>	95
<b>CHAPTER VIII: BREEDER POULTRY FLOCK AND HATCHERY MANAGEMENT</b>		<b>96 - 111</b>
8.1.	Breeder Poultry Flock and Hatchery Management	96 - 111
8.1.1.	Breeder Poultry Flock Management	96 - 107
8.1.1.1.	Chicken (Layer and Broiler)	96 - 101

Chapter	Subject	Page No.
	8.1.1.1.1. <i>Management of Breeder Flock</i>	96 - 98
	8.1.1.1.2. <i>Feed and Body Weight Management</i>	99 - 100
	8.1.1.1.3. <i>Lighting Management</i>	100 - 101
8.1.1.2.	Duck	102 - 105
	8.1.1.2.1. <i>Management of Breeder Duck Flock</i>	102 - 103
	8.1.1.2.2. <i>Feed and Body Weight Management</i>	103 - 104
	8.1.1.2.3. <i>Lighting Management</i>	105
8.1.1.3.	Producing Clean Hatching Eggs	106
8.1.1.4.	Fertility Disorders in Breeder Poultry	106 - 107
8.1.1.5.	Selection and Culling of Breeder in the Flocks	107
8.1.2.	Hatchery management	108 -111
	8.1.2.1. Collection of Hatching Egg and Management	108 - 109
	8.1.2.2. Incoming Hatching Egg Management	109
	8.1.2.3. Hatchery Facility	110
	8.1.2.4. Hatchery Operation and Management	110 - 111
	8.1.2.5. Transport of Day-Old Birds (Chick and Ducking)	111
	8.1.2.6. Records and Documentation	111
<b>CHAPTER IX: COMMERCIAL POULTRY FLOCK MANAGEMENT</b>		<b>112 - 122</b>
9.1.	Commercial Poultry Flock Management	112 - 122
9.1.1.	Brooding Management of Commercial and Breeder Flocks	112 - 114
9.1.2.	Commercial Layer Flock Management	114 - 119
	9.1.2.1. Layer Grower (and Pullet) Management	114 - 117
	9.1.2.2. Commercial Laying Flock Management	117 - 119
9.1.3.	Commercial Broiler Flock Management	119 - 120
9.1.4.	Commercial Meat Flock Management	121 - 122
<b>CHAPTER X: HERD MANAGEMENT</b>		<b>123 - 154</b>
10.1.	Management of Livestock Herd	123 - 154
10.1.1.	Pregnancy and Parturition Management	123 - 128
	10.1.1.1. Cattle and Buffalo	123 - 125
	10.1.1.1.1. <i>Pregnancy Management</i>	123 -124
	10.1.1.1.2. <i>Parturition Management</i>	124 - 125
	10.1.1.2. Goat and Sheep.	125 - 127
	10.1.1.2.1. <i>Pregnancy Management</i>	125 - 126
	10.1.1.2.2. <i>Parturition Management</i>	126 - 127
	10.1.1.3. Pig	127 - 128
	10.1.1.3.1. <i>Pregnancy Management</i>	127
	10.1.1.3.2. <i>Parturition (Farrowing) Management</i>	128

Chapter	Subject	Page No.
10.1.2.	Periparturient, Lactation and Dry off Management of Livestock	129 - 154
10.1.2.1.	Periparturient Management	129 - 148
10.1.2.1.1.	Prevention and Control of Periparturient Diseases	131 - 148
	A. Milk Fever	131 - 132
	B. Ketosis or Pregnancy Toxemia	133 - 135
	C. Grass Tetany or Grass Staggers	136 - 137
	D. Mastitis	137 - 140
	E. Retention of Placenta/Retained Placenta/Retained Fetal Membranes	140 - 142
	F. Uterine Diseases: Metritis, Endometritis, Pyometra, Hydrometra & Mucometra	143 - 146
	G. Postpartum Dysgalactia Syndrome (PDS) in Sows	147 - 148
10.1.3.	Lactation Management	149 - 154
10.1.3.1.	Nutrition during Lactation	149 - 151
10.1.3.2.	Reproductive Events in Dairy Cows during Lactation	151 - 152
10.1.3.3.	Milking Management	152 - 153
10.1.3.4.	Other Management during Lactation	153 - 154
10.1.4.	Dry-off Management	154
<b>CHAPTER XI: NEONATE AND INFANT MANAGEMENT OF LIVESTOCK</b>		<b>155 - 164</b>
11.1.	Care of Newborn	155 - 156
11.2.	Colostrum Feeding to the Newborn	156
11.3.	Milk Feeding to the Newborn	157
11.4.	Newborn Rearing	157 - 158
11.5.	Health Management of Newborn	158
11.6.	Weaning Management	159 - 164
11.6.1.	Cattle and Buffalo	159 - 161
11.6.2.	Goat and Sheep	162 - 163
11.6.3.	Pig	163 - 164
<b>CHAPTER XII: YOUNG STOCK MANAGEMENT OF LIVESTOCK</b>		<b>165 - 174</b>
12.1.	Young Stock Management of Livestock	165 - 174
12.1.1.	Cattle and Buffalo	165 - 171
12.1.1.1.	Replacement Dairy Stock Management	165 - 166
	12.1.1.1.1. <i>Nutritional Management of Replacement Dairy Heifers</i>	167 - 168
	12.1.1.2. Meat Herd Management	168 - 171
	12.1.1.2.1. <i>Beef Cattle Management (Beef Fattening)</i>	171 - 171
12.1.2.	Goat and Sheep	171- 173
12.1.3.	Pig	173 - 174

Chapter	Subject	Page No.
<b>CHAPTER XIII: PREVENTION AND CONTROL OF ANIMAL DISEASES</b>		<b>175 - 184</b>
13.1.	Prevention and Control of Animal Diseases	175 - 184
13.1.1.	Prevention of Animal Diseases	175 - 180
13.1.1.1.	Principles of Animal Disease Prevention	175 - 176
13.1.1.2.	Practice of Animal Disease Prevention	176 - 180
13.1.2.	Control of Animal Diseases	180 - 184
13.1.2.1.	General Considerations for Animal Disease Control	180 - 181
13.1.2.2.	Practices of Animal Disease Control	181 - 184
<b>CHAPTER XIV: OTHER PRACTICES IN ANIMAL MANAGEMENT</b>		<b>185 - 205</b>
14.1.	Other Practices in Animal Management	185 - 205
14.1.1.	Castration of Males	185
14.1.2.	Hoof Trimming	185 - 186
14.1.3.	Shoeing of Cattle	186 - 187
14.1.4.	Disbudding and Dehorning	187
14.1.5.	Extra Teat Removal	188
14.1.6.	Dipping	188 - 196
14.1.6.1.	Types Dipping	188 - 193
14.1.6.1.1.	<i>Plunge Dip</i>	189 - 190
14.1.6.1.2.	<i>Spray Race and Spray-Dip Machine</i>	190 - 191
14.1.6.1.3.	<i>Topical Treatments/Pour-Ons/Spot-Ons/Back-Spraying</i>	191
14.1.6.1.4.	<i>Hand Spraying</i>	191
14.1.6.1.5.	<i>Hand Dressing</i>	192
14.1.6.1.6.	<i>Belly-Baths/Belly-Dipping</i>	192
14.1.6.1.7.	<i>Foot-Dipping/Foot Bathing</i>	193
14.1.6.1.8.	<i>Hand Bath</i>	193
14.1.6.1.9.	<i>Sandpit Dipping/Sand Bath/Dust Bath</i>	193
14.1.6.2.	Acaricides, Pesticides, Insecticides and Chemicals Used in Dips	193 - 194
14.1.6.3.	Frequency of Dipping	194
14.1.6.3.1.	<i>In Cattle</i>	194
14.1.6.3.2.	<i>In Goats and Sheep</i>	194
14.1.6.3.3.	<i>In Pigs</i>	194
14.1.6.3.4.	<i>In Poultry</i>	194
14.1.6.4.	Precautions of Dipping	195 - 196
14.1.6.4.1.	<i>Precautions before Dipping</i>	195 - 196
14.1.6.4.2.	<i>Precautions after Dipping</i>	196

Chapter	Subject	Page No.
14.1.7.	Bathing/Showering for Cleaning and Cooling of Animals	197
	14.1.7.1. Livestock	197
	14.1.7.2. Poultry	197
14.1.8.	Grooming	198 - 202
	14.1.8.1. Livestock	198
	14.1.8.2. Poultry	199
	14.1.8.3. Importance of Animal (Livestock and Poultry) Grooming	199 - 200
	14.1.8.4. Purposes of Grooming in Livestock	200
	14.1.8.5. Grooming Equipment and Types of Grooming	200 - 202
14.1.9.	Exercising of Livestock	202 - 203
14.1.10.	Broody Control in Poultry	203 - 204
<b>CHAPTER XV: ANIMAL PRODUCT HANDLING, PREPARATION, PROCESSING, MARKETING AND FOOD SAFETY</b>		<b>205 - 221</b>
15.1.	Animal Product Handling and Preparation	205 - 214
15.1.1.	Egg Management (Table eggs)	205 - 210
	15.1.1.1. Minimum Standard of Table Eggs	205
	15.1.1.1.1. <i>Minimum Requirements for Intact or Unbroken Table Eggs</i>	205
	15.1.1.1.2. <i>Minimum Requirements for Broken-Out Table Eggs</i>	205
	15.1.1.2. Handling, Preparation and Management of Table Eggs	205 - 210
	15.1.1.2.1. <i>Egg Collection and Sorting</i>	206
	15.1.1.2.2. <i>Egg Cleaning and Decontamination</i>	206 - 209
	A. Dry Cleaning	207
	B. Wet Cleaning (Egg washing)	208 - 209
	C. Pasteurization of Eggs	209
	15.1.1.2.3. <i>Egg Storage, Packaging, Transportation and Record Keeping</i>	210
15.1.2.	Milk Handling and Management	210 - 211
15.1.3.	Meat Handling, Preparation and Management	212 - 214
	15.1.3.1. General Guidelines	212
	15.1.3.2. Slaughterhouse, Meat Selling Center and Meat Processing Plant Establishment	212 - 213
	15.1.3.3. Slaughter, Examination, Production, Preservation and Transport of Meat etc.	213 - 214
	15.1.3.4. Waste Management	214

Chapter	Subject	Page No.
15.2.	Processing and Marketing of Animal Products	215 - 217
15.2.1.	Eggs	215
	15.2.1.1. Egg Processing and Packaging	215
	15.2.1.2. Egg Marketing	215
15.2.2.	Milk	216
	15.2.2.1. Milk Processing, Preservation, Packaging and Marketing	216
15.2.3.	Meat	217
	15.2.3.1. Meat Processing, Preservation, Packaging and Marketing	217
15.3.	Food Safety of Animal Products (Egg, Milk and Meat)	218 - 221
15.3.1.	Present Food Safety Situations of Animal Products in Bangladesh	218 - 220
15.3.2.	Ensuring Food Safety of Animal Products from 'Farm to Fork'	220 - 221
<b>CHAPTER XVI: ANIMAL WELFARE AND RESPONSIBILITIES OF ANIMAL ENTERPRISES</b>		<b>222 - 233</b>
16.1.	Animal Welfare	222 - 225
16.1.1.	General Guidelines	222 - 223
16.1.2.	Animal Welfare on Handling and Restraining of Animal	223
16.1.3.	Animal Welfare in Poultry Hatchery	223
16.1.4.	Animal Welfare on Transportation of Animals	224 - 225
16.2.	Responsibilities of Animal Enterprises	225 - 233
16.2.1.	Responsibilities of Owner to the Workers and Managers	225 - 226
16.2.2.	Legal Responsibilities of the Owner/Farm Manager	226
16.2.3.	Animal Welfare Responsibilities	226 - 227
	16.2.3.1. The farm workers should not cause cruelty to animals, in accordance with 'The Animal Welfare Act, 2019' of Bangladesh	226 - 227
	16.2.3.2. Farm Workers Should Not Neglect Animals as per the Criteria Mentioned	227
16.2.4.	Documentation, Review and Evaluation Responsibilities	227
	16.2.4.1. Record Keeping	227 - 232
	16.2.4.1.1. Criteria for Good Record Keeping	228
	16.2.4.1.2. Types of Farm Recordings	228 - 232
	16.2.4.2. Review and Evaluation of the Practices	233
<b>REFERENCES</b>		<b>234 - 238</b>

Chapter	Subject	Page No.
<b>APPENDICES</b>		<b>239 - 295</b>
Appendix 1:	গ্রান্ড গ্র্যান্ড/গ্রান্ড প্যারেন্ট (জিজিপি/জিপি) স্টক খামার স্থাপন এর শর্তাবলী	239
Appendix 2:	প্যারেন্ট খামার স্থাপন এর শর্তাবলী	240
Appendix 3:	বাণিজ্যিক খামার (জিপি ও পি এস বাদে) স্থাপন এর শর্তাবলী	241
Appendix 4:	গ্রান্ড গ্রান্ড প্যারেন্ট স্টক/গ্রান্ড প্যারেন্ট স্টক স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র	242
Appendix 5:	হাঁস-মুরগীর প্যারেন্ট স্টক/বাণিজ্যিক খামার স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র	243
Appendix 6:	গরু/মহিষ/ছাগল/ভেড়া সহ বিভিন্ন রোমছুক পশুর বাণিজ্যিক খামার স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র	244
Appendix 7:	নিবন্ধন প্রদানের মতাপ্রাপ্ত কর্মকর্তা	245
Appendix 8:	নিবন্ধন সনদপত্র	246
Appendix 9:	Semen Collection and Artificial Insemination in Poultry	247 - 248
Appendix 10:	Recommended Stocking Density of Layer Breeder Chicken	248
Appendix 11:	Recommended Temperature for Layer Breeder Chicken	249
Appendix 12:	Feeder and waterer space requirements for Poultry (Chickens)	249
Appendix 13:	Nutrient Requirements Layer Breeder of Different Age Groups	250
Appendix 14:	Recommended Lighting Program in Light-Controlled Rearing and Laying Houses	251
Appendix 15:	Layer Breeder Chicken Stock Performance Potential Traits	252
Appendix 16:	Nutritional Requirements for Commercial Chicks (Chick Mash)	253
Appendix 17:	Nutritional Requirements for Commercial Pullets (Grower Mash)	253
Appendix 18:	Nutritional Requirements for Commercial Layer (Layer Mash)	254
Appendix 19:	Nutritional Requirements for Commercial Old Layers	254
Appendix 20a:	Nutritional Requirements of Broiler Chicks (Starter)	255
Appendix 20b:	Nutritional Requirements of Broilers (Grower)	255
Appendix 20c:	Nutritional Requirements of Broiler (Finisher)	256
Appendix 21:	Basic Nutrition Requirement for Breeder Ducklings and Breeder Layer Ducks	256
Appendix 22:	Target Weights and Feeding Schedules for Duckling and Breeder Layer Ducks	257
Appendix 23:	Drinking water quality guidelines for poultry	258
Appendix 24:	Suitability of water for poultry with different concentrations of Total Dissolved Solids (TDS)	259
Appendix 25:	3-weeks Heat Calendar for Livestock	260

Chapter	Subject	Page No.
Appendix 26:	Important Reproductive Details/Breeding Guidelines for Cattle and Buffalo	261
Appendix 27:	Nutrient Guidelines for Lactating Dairy Cows	262 - 263
Appendix 28:	Nutrient Requirements for Dairy Heifers	263
Appendix 29:	Calf Milk Replacer (Non-Medicated)	264
Appendix 30:	Vaccination Schedule for Poultry	265 - 266
Appendix 31:	Vaccination Schedules for Cattle and Buffalo	267
Appendix 32:	Vaccination Schedules for Sheep and Goat	267
Appendix 33:	Vaccination Schedules for Pig	268
Appendix 34:	De-worming Schedule for Poultry	268
Appendix 35:	De-worming Schedule for Livestock	269
Appendix 36:	The Basic Techniques of Hoof Trimming in Cattle	270
Appendix 37:	Procedure of Shoeing in Animals	271
Appendix 38:	Procedures of Disbudding and Dehorning	272
Appendix 39:	Components of Plunge Dip, Dipping Procedure, and Its Advantages and Disadvantages	273 - 277
Appendix 40:	Components, Spraying Procedure, and Advantages and Disadvantages of Spray Race	278
Appendix 41:	Advantages and disadvantages of Topical Treatments/Pour-Ons/ Spot-Ons/Back-spraying	279
Appendix 42:	Advantages and disadvantages of Hand Spraying	280
Appendix 43:	Procedure of Bathing and/or Showering of Livestock	280 - 282
Appendix 44:	Cooling and Cleaning of Cows	283 - 285
Appendix 45:	Procedure of Grooming in Livestock	286 - 287
Appendix 46:	Recommendations for Validation, Approval, Dissemination and Implementation of NG-GLPP	288 - 290
Appendix 47:	Validation Review Committees	291
Appendix 48:	List of the Participants Nominated by the DLS for the Validation Workshop in the GO	292 - 293
Appendix 49:	Groups of the Validation Workshop	294 - 295

### III. ABBREVIATIONS

<b>Abbreviations</b>	<b>Full Form</b>
AI	Artificial Insemination
BAB	Bangladesh Accreditation Board
BCS	Body Condition Score
NG-GLPP	National Guidelines on Good Livestock Production Practices
BRTA	Bangladesh Road Transport Authority
bST	Bovine Somatotropin
bwt	Body Weight
Ca	Calcium
CC	Concrete-Cement
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CSF	Classical Swine Fever
DLS	Department of Livestock Services
DM	Dry Matter
DM	Dry Matter
DMI	Dry Matter Intake
ECH	Environment Control House
ES	Estrous Synchronization
FCR	Feed Conversion Rate
FMD	Foot and Mouth Disease
FTU	Finger-tip unit
GLHP	Good Livestock Husbandry Practices
GnRH	Gonadotropin Releasing Hormone
HPAI	Highly Pathogenic Avian Influenza
ID	Identification
ILO	International Labor Organization

<b>Abbreviations</b>	<b>Full Form</b>
IM	Intra-Muscular
IPM	Integrated Pest Management
K	Potassium
LP	Lactation Period
Mg	Magnesium
MgCl <sub>2</sub>	Magnesium Chloride
MgO	Magnesium Oxide
MgSO <sub>4</sub>	Magnesium Sulphate
MMA	Mastitis-Metritis-Agalactia
N	Nitrogen
Na	Sodium
ND	Newcastle Disease
NEB	Negative Energy Balance
NH <sub>3</sub>	Ammonia
O <sub>2</sub>	Oxygen
OvSynch	Ovulation Synchronization
P	Phosphorus
PDS	postpartum dysgalactia syndrome
PG	Prostaglandin
PPR	Peste des Petits Ruminants
RCC	Red Chittagong Cattle
Reg. Vet	Registered Veterinarian
Se	Selenium
SST	Sperm Storage Tubules
TAI	Timed Artificial Insemination
UHT	Ultra High Temperature
WOAH	World Organization for Animal Health

#### IV. RESOURCES

- A Management Program for Raising Breeder Duck Flocks. By Gary S. Davis and Ken E. Anderson, Extension Poultry Specialists, North Carolina State University, USA. Available at: <https://poultry.ces.ncsu.edu/backyard-flocks-eggs/other-fowl/breeder-duck/>
- A Review Article of Artificial Insemination in Poultry. By Tarekegn Getachew, School of Animal and Range Sciences, Haramaya University, Haramaya, Ethiopia. 2016. Published in: *World's Veterinary Journal*, 6(1): 25-33. Available at: [https://wj.science-line.com/attachments/article/37/World%20Vet.%20J.%206\(1\)%2025-33,%20March%2025,%202016.pdf](https://wj.science-line.com/attachments/article/37/World%20Vet.%20J.%206(1)%2025-33,%20March%2025,%202016.pdf)
- Are You Buying A Pullet or Hen? How to Tell the Difference? A blog post by The Happy Chicken Coop. 2022. Available at: <https://www.thehappychickencoop.com/are-you-buying-a-pullet-or-hen/>
- Artificial Insemination in Turkeys and Chickens. By Keith Bramwell, PhD, Jamesway Chick Master Incubator Company. 2021. In: *MSD and the MSD Veterinary Manual*. Available at: <https://www.msdevetmanual.com/poultry/artificial-insemination/artificial-insemination-in-turkeys-and-chickens>
- ASEAN (Association of Southeast Asian Nations) Good Animal Husbandry Practices- For Layers and Broilers and Food Safety. 2015. By Robert Premier. Available at: <https://asean.org/wp-content/uploads/2021/09/ASEAN-Food-Safety-Module-GAHP-For-Layers-and-Broilers.pdf>
- Bangladesh Animal and Animal Products Quarantine Act, 2005 of Bangladesh
- Best cattle and buffaloes: Selection and procurement. By AKS Tomar and CD Miranda, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India. 2019. In book: *Indian Farming*, 69(08): 14–15. Available at: [https://www.researchgate.net/publication/338912891\\_Best\\_cattle\\_and\\_buffaloes\\_Selection\\_and\\_procurement](https://www.researchgate.net/publication/338912891_Best_cattle_and_buffaloes_Selection_and_procurement)
- Best Management Practices for the Prevention of Entry of Disease onto Livestock Operations. By Animal Health Diagnostic Center, College of Veterinary Medicine, Cornell University, USA. Available at: <https://www.vet.cornell.edu/animal-health-diagnostic-center/programs/nyschap/modules-documents/best-management-practices-prevention-entry-disease-livestock-operations>
- Body Condition Scoring. By: Saskatchewan. Available at: <https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/livestock/animal-health-and-welfare/body-scoring#:~:text=Body%20condition%20scoring%20is%20a,nutritional%20status%20of%20your%20herd.>
- Bovine mastitis: prevalence, risk factors and isolation of *Staphylococcus aureus* in dairy herds at Hawassa milk shed, South Ethiopia. By Rahmeto Abebe and co-workers. 2016. Published in: *BMC Veterinary Research*, 12:270. Available at: <https://bmcvetres.biomedcentral.com/articles/10.1186/s12917-016-0905-3>

- Bovine mastitis: risk factors, therapeutic strategies, and alternative treatments-A review. By Wei Nee Cheng and Sung Gu Han. 2020. Published in: Asian-Australasian Journal of Animal Sciences, Vol. 33, No. 11, Pp. 1699-1713. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7649072/pdf/ajas-20-0156.pdf>
- Breed Improvement and Fertility Management. Training Package for Dairy Extension Workers. 2017. Available at: [https://snv.org/cms/sites/default/files/explore/download/breed\\_improvement\\_and\\_fertility\\_management\\_training\\_manual\\_and\\_guideline.pdf](https://snv.org/cms/sites/default/files/explore/download/breed_improvement_and_fertility_management_training_manual_and_guideline.pdf)
- Breeder farm management. By Jerson Andrés Cuéllar Sáenz. 2021. Veterinaria Digital blog page. Available at: <https://www.veterinariadigital.com/en/articulos/breeder-farm-management/>
- Breeder management. TNAU (Tamil Nadu Agricultural University, Tamil Nadu, India). 2022. Visited the site on 10 August 2022. Available at: [http://www.agritech.tnau.ac.in/expert\\_system/poultry/Breeder%20Management.html](http://www.agritech.tnau.ac.in/expert_system/poultry/Breeder%20Management.html)
- Breeding management of cattle and buffaloes. By Tamil Nadu Agricultural University (TNAU), Tamil Nadu, India. Available at: [http://www.agritech.tnau.ac.in/expert\\_system/cattlebuffalo/Breeding%20management%20of%20cattle%20and%20buffaloes-2.html](http://www.agritech.tnau.ac.in/expert_system/cattlebuffalo/Breeding%20management%20of%20cattle%20and%20buffaloes-2.html)
- Broiler Breeder Management is No Easy Task, The Poultry Site. By Jackie Linden. 2013. Available at: [https://www.thepoultrysite.com/articles/broiler-breeder-management-is-no-easy-task#:~:text=Feed%20intake%20and%20photostimulation%20are,Extension%20Instructor\)%20and%20Haitham%20M.](https://www.thepoultrysite.com/articles/broiler-breeder-management-is-no-easy-task#:~:text=Feed%20intake%20and%20photostimulation%20are,Extension%20Instructor)%20and%20Haitham%20M.)
- Broiler breeding flocks: management and animal welfare. By Ingrid C. de Jong and Rick A. van Emous, Wageningen Livestock Research, The Netherlands. 2017. In book: Achieving sustainable production of poultry meat, Volume 3. Available at: [https://www.researchgate.net/publication/319626407\\_Broiler\\_breeding\\_flocks\\_management\\_and\\_animal\\_welfare](https://www.researchgate.net/publication/319626407_Broiler_breeding_flocks_management_and_animal_welfare)
- Care and Management of Pregnant Cows. By Sunita Kalita, Assistant Professor, Department of Livestock Farm Complex, R. R. College of Veterinary and Animal Science, Deoli, Rajasthan, India. 2022. Available at: <https://epashupalan.com/11949/animal-husbandry/care-and-management-of-pregnant-cows/>
- Care of growing duck. Animal Husbandry, TNAU Agritech Portal, Tamil Nadu Agricultural University (TNAU). 2015. Available at: [https://agritech.tnau.ac.in/animal\\_husbandry/animhus\\_duck\\_care%20of%20growing.html#:~:text=Under%20intensive%20system%2C%20a%20floor,ft.](https://agritech.tnau.ac.in/animal_husbandry/animhus_duck_care%20of%20growing.html#:~:text=Under%20intensive%20system%2C%20a%20floor,ft.)
- Care of Pregnant Animals. Farmer's Corner. Available at: <https://www.nddb.coop/farmer/animal-nutrition/care-of-pregnant-animals>
- Cattle and Buffalo: General Disease Prevention and Control Measures. By Tamil Nadu Agriculture University, India. Available at: [https://agritech.tnau.ac.in/expert\\_system/cattlebuffalo/general%20disease%20prevention.html](https://agritech.tnau.ac.in/expert_system/cattlebuffalo/general%20disease%20prevention.html)

- Climate-smart livestock production. *A practical guide for Asia and the Pacific region*. By FAO (Food and Agriculture Organization of the United Nations), Bangkok, Thailand. 2021. Available at: <https://www.fao.org/3/cb3170en/cb3170en.pdf>
- Cost-benefit analysis of the backyard duck production systems in the rural areas of Bangladesh: A study in Laksam upazila, Comilla. By N Islam and co-workers. 2020. *Bangladesh Journal of Veterinary and Animal Sciences*, 8(2):157-164.
- Dairy replacements are valuable and necessary, Calves & Heifers. By Progressive Dairy. 2010. Available at: <https://www.agproud.com/articles/30191-dairy-replacements-are-valuable-and-necessary>
- Decree on The Prevention and Control of Animal Diseases. By the Government of the Lao People's Democratic Republic. 2012. Available at: [https://www.wto.org/english/thewto\\_e/acc\\_e/lao\\_e/wtacclao36a1\\_leg\\_7.pdf](https://www.wto.org/english/thewto_e/acc_e/lao_e/wtacclao36a1_leg_7.pdf)
- Defining Traits of a Duck. By Melissa Mayntz. 2022. Available at: <https://www.thespruce.com/what-is-a-duck-387099>
- Duck genetic resources, their improvement and conservation In Bangladesh: A Review. By MA Hamid. 2019. Published in: *The SAARC Journal of Agriculture*, 17(2): 31-42.
- Effects of milking stall dimensions on behavior of dairy cows during milking in different milking parlor types. By: Y. Gómez and co-workers. 2017. Available at: <https://www.sciencedirect.com/science/article/pii/S002203021630875X>
- Effects on animal welfare- Cessation of lactation, An. invited review. By G. Zobel and co-workers. 2015. Available at: [https://www.journalofdairyscience.org/article/S0022-0302\(15\)00686-4/pdf](https://www.journalofdairyscience.org/article/S0022-0302(15)00686-4/pdf)
- Environmentally Controlled House-In Poultry Production. By: Kuldeep Kumar Verma and coworkers. 2014. Available at: [https://www.researchgate.net/publication/324483130\\_Environmentally\\_Controlled\\_House-In\\_Poultry\\_Production](https://www.researchgate.net/publication/324483130_Environmentally_Controlled_House-In_Poultry_Production)
- Establishing the weaned pig. By AHDB. Available at: <https://ahdb.org.uk/knowledge-library/establishing-the-weaned-pig#:~:text=Weaning%20generally%20involves%20a%20major,promote%20gut%20health%20and%20stability.>
- Estrus Detection in Cattle. By- The Beef Site. 2010. Available at: <https://www.thebeefsite.com/articles/2362/estrus-detection-in-cattle/>
- Farm Animal Genetic Resources in Bangladesh: Diversity, Conservation and Management. In: *Farm Animal Genetic Resources in SAARC Countries: Diversity, Conservation and Management*. AKFH Bhuiyan. 2014. Available at: [https://www.researchgate.net/publication/309293109\\_Farm\\_Animal\\_Genetic\\_Resources\\_in\\_Bangladesh\\_Diversity\\_Conservation\\_and\\_Management](https://www.researchgate.net/publication/309293109_Farm_Animal_Genetic_Resources_in_Bangladesh_Diversity_Conservation_and_Management)
- Feeding piglets better: An eight-step checklist. 2012. Available at: <https://www.pigprogress.net/pigs/feeding-piglets-better-an-eight-step-checklist/>
- Feeding the Dairy Cow During Lactation. Dairy Cattle Production 342-450A. By Department of Animal Science, Faculty of Agricultural and Environmental Sciences, MacDonald Campus, McGill University. Available at: [https://smallfarms.oregonstate.edu/sites/agscid7/files/feedingmilkingcow\\_1.pdf](https://smallfarms.oregonstate.edu/sites/agscid7/files/feedingmilkingcow_1.pdf)

- Floor Space Requirements for Broilers & Layers + Calculator. By: Akinbobola A. 2022. Available at: [https://www.livestocking.net/floor-space-requirements-broilers#Problems\\_of\\_Overstocking\\_or\\_Overcrowding](https://www.livestocking.net/floor-space-requirements-broilers#Problems_of_Overstocking_or_Overcrowding)
- Foot and mouth disease control strategy for Northern Ireland. By the Department agriculture, Environment and Rural Affairs, Northern Ireland, UK. 2016. Available at: <https://www.daera-ni.gov.uk/sites/default/files/publications/dard/foot-and-mouth-disease-control-strategy-may-2016.PDF>
- General Disease Prevention and Control Measures. By Expert System for Cattle and Buffalo, Tamil Nadu Agricultural University (TNAU), India. Available at: [https://agritech.tnau.ac.in/expert\\_system/cattlebuffalo/general%20disease%20prevention.html](https://agritech.tnau.ac.in/expert_system/cattlebuffalo/general%20disease%20prevention.html)
- Getting Weaned Pigs to Eat. By Ioannis Mavromichalis, Ph.D., Swine Nutritionist, SCA Nutrition. 2001. Available at: [https://www.nationalhogfarmer.com/news/farming\\_getting\\_weaned\\_pigs](https://www.nationalhogfarmer.com/news/farming_getting_weaned_pigs)
- Guide to good farming practices for animal production and food safety. By FAO (Food and Agriculture Organization of the United Nations) and OIE (World Organization for Animal Health). 2009. Available at: [https://www.oie.int/fileadmin/Home/eng/Current\\_Scientific\\_Issues/docs/pdf/eng\\_guide.pdf](https://www.oie.int/fileadmin/Home/eng/Current_Scientific_Issues/docs/pdf/eng_guide.pdf)
- Guide to Pig Management: Weaning (Part 5). By Diego Padoan. 2021. Available at: <https://www.biomin.net/science-hub/guide-to-pig-management-lactation-part-5/#:~:text=Drinking%20water%20helps%20the%20piglets,and%20feed%20intake%20after%20weaning.>
- Guidelines for Animal Disease Control. By World Organization for Animal Health (WOAH). 2014. Available at: [https://www.woah.org/fileadmin/Home/eng/Our\\_scientific\\_expertise/docs/pdf/A\\_Guidelines\\_for\\_Animal\\_Disease\\_Control\\_final.pdf](https://www.woah.org/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/A_Guidelines_for_Animal_Disease_Control_final.pdf)
- Hoof Trimming of Dairy Cows. By Haley B. Reichenbach and Donna M. Amaral-Phillips, Department of Animal and Food Science, College Agriculture, Food and Environment. Lexington, KY, USA. Available at: [https://afs.ca.uky.edu/content/dairy-hoof-trimming-dairy-cows#:~:text=Twice%20yearly%20hoof%20trimming%20is,known%20as%20hairly%20heel%20warts\).](https://afs.ca.uky.edu/content/dairy-hoof-trimming-dairy-cows#:~:text=Twice%20yearly%20hoof%20trimming%20is,known%20as%20hairly%20heel%20warts).)
- How to check day-old chick quality? By Fabian Brockotter, Editor in Chief, Poultry World. 2020. Published by Poultry World. Available at: <https://www.poultryworld.net/health-nutrition/how-to-check-day-old-chick-quality/>
- How to manage cows yielding 20,000 kg of milk: technical challenges and environmental implications. By Giuseppe Pulina and coworkers. 2020. Available at: <https://www.tandfonline.com/doi/full/10.1080/1828051X.2020.1805370>
- How to optimize layer breeder flock performance, Poultry World. By Andrea Beneventi, Senior Technical Specialist NOVOGEN, France. 2021. Available at: <https://www.poultryworld.net/health-nutrition/how-to-optimise-layer-breeder-flock-performance/>

- How to Predict Parturition in Cattle? A Literature Review of Automatic Devices & Technologies for Remote Monitoring and Calving Prediction. By Martina Crociati and Co-workers. 2022. Published in: *Animals* 12, 405.  
<https://doi.org/10.3390/ani12030405>
- Ketosis or pregnancy toxemia in the doe. A SWEETLIX blog. 2006. Available at:  
<https://www.sweetlix.com/research-articles/goats/ketosis-or-pregnancy-toxemia-in-the-doe/>
- Lists of Undesirable Substances and Limited Uses of Feed Ingredients. By: USDA Foreign Agricultural Service (FAS) under the Global Agricultural Information Network (GAIN), GAIN Report Number: MO1838, Date: 8 June 2018, Rabat, Morocco. Available at:  
[https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Lists%20of%20Undesirable%20Substances%20and%20Limited%20Uses%20of%20Feed%20Ingredients\\_Rabat\\_Morocco\\_8-6-2018.pdf](https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Lists%20of%20Undesirable%20Substances%20and%20Limited%20Uses%20of%20Feed%20Ingredients_Rabat_Morocco_8-6-2018.pdf)
- Livestock and Poultry: Housing. By: Tamil Nadu Veterinary and Animal Science University, Chennai, India. 2015. Available at:  
[https://agritech.tnau.ac.in/animal\\_husbandry/animhus\\_cb\\_housing\\_units.html](https://agritech.tnau.ac.in/animal_husbandry/animhus_cb_housing_units.html)
- Livestock disease management. By UN Climate Technology Center & Network (CTCN). Available at: <https://www.ctc-n.org/technologies/livestock-disease-management#:~:text=These%20include%3A%20controlled%20breeding%2C%20controlling,options%2C%20and%20vector%20control%20techniques.>
- Management of cow around parturition. By Prasanna Pal and Co-workers. 2019. Available at:  
[https://www.researchgate.net/publication/347002940\\_Management\\_of\\_cow\\_around\\_parturition](https://www.researchgate.net/publication/347002940_Management_of_cow_around_parturition)
- Management of Lactating Animals for Maximizing Milk Production. By: Puja Mondal. Available at: <https://www.yourarticlelibrary.com/dairy-farm-management/management-of-lactating-animals-for-maximising-milk-production/35945>
- Management of the gilt for breeding and in first gestation for longevity. By Rob Knox, Department of Animal Sciences, University of Illinois, Champaign-Urbana and Jenny Patterson and George Foxcroft, Swine Research and Technology Center, University of Alberta, Edmonton. 2015. Available at:  
<https://www.nationalhogfarmer.com/reproduction/management-gilt-breeding-and-first-gestation-longevity>
- Management Program for Raising Breeder Duck Flocks. By Jackie Linden. Published in: *The Poultry Site*. 2014. Available at:  
<https://www.thepoultrysite.com/articles/management-programme-for-raising-breeder-duck-flocks>
- Managing Cow Lactation Cycles. By- The Cattle Site, Montana State University. 2015. Available at: <https://www.thecattlesite.com/articles/4248/managing-cow-lactation-cycles/>

- Managing the Postpartum Interval. By- The Cattle Site, Montana State University. 2006. Available at: <https://www.thecattlesite.com/articles/1011/managing-the-postpartum-interval/>
- Minimizing the Stress of Weaning Beef Calves. A Featured Articles. Published in 'The Cattle Site'. 2011. Available at: <https://www.thebeefsite.com/articles/2768/minimising-the-stress-of-weaning-beef-calves/>
- Minimizing Weaning Stress in Sheep and Goats. By Valens Niyigena. 2021. Available at: [https://www.aces.edu/blog/topics/animals-urban/minimizing-weaning-stress-in-sheep-and-goats/#:~:text=Animals%20should%20be%20handled%20slowly,mastitis%20\(inflamed%20mammary%20tissue\).](https://www.aces.edu/blog/topics/animals-urban/minimizing-weaning-stress-in-sheep-and-goats/#:~:text=Animals%20should%20be%20handled%20slowly,mastitis%20(inflamed%20mammary%20tissue).)
- Minimizing Weaning Stress on Calves. By Clay P. Mathis, Extension Livestock Specialist; and Boone Carter, Extension Associate, New Mexico State University, USA, revised by Craig Gifford, Shiann Burns, and Marcy Ward, College of Agricultural, Consumer and Environmental Sciences, New Mexico State University, USA. 2018. Available at: [https://pubs.nmsu.edu/\\_b/B221/index.html#:~:text=Tips%20to%20Minimize%20Stress%20from%20Weaning&text=During%20separation%20at%20weaning%2C%20move,nose%20contact%20while%20preventing%20nursing.](https://pubs.nmsu.edu/_b/B221/index.html#:~:text=Tips%20to%20Minimize%20Stress%20from%20Weaning&text=During%20separation%20at%20weaning%2C%20move,nose%20contact%20while%20preventing%20nursing.)
- National Dairy Development Policy, 2019 (final draft) of Bangladesh
- National Livestock Development Policy, 2007 of Bangladesh.
- National Livestock Extension Policy, 2013 (draft) of Bangladesh
- National Poultry Development Policy, 2008 of Bangladesh
- Parturition in Livestock. By Dr. Mike Neary, Extension Animal Scientist, Purdue University Cooperative Extension Service, Purdue University, West Lafayette, Indiana, USA. Available at: <https://www.extension.purdue.edu/extmedia/as/as-561-w.pdf>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practices for Chickens - Broilers and Layers. By Bureau of Agriculture and Fisheries Standard, Philippines. 2016. Available at: <https://www.studocu.com/ph/document/bulacan-state-university/computer-engineering/pns-bafs-1842016-gahp-chicken-broilers-layers/21641904>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practices (GAHP). By Bureau of Product Standards, Philippines. 2008. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/3-pns-bafps-60-2008-code-of-good-animal-husbandry-practices-gahp>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice for Dairy Cattle and Water Buffalo. By Bureau of Agriculture and Fisheries Standard, Philippines. 2017. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/6-pns-bafs-199-2017-code-of-good-animal-husbandry-practice-for-dairy-cattle-and-water-buffalo>

- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice for Beef Cattle and Buffalo. By Bureau of Agriculture and Fisheries Standard, Philippines. 2017. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/7-pns-bafs-200-2017-code-of-good-animal-husbandry-practice-for-beef-cattle-and-buffalo>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice for Goats. By Bureau of Agriculture and Fisheries Standard, Philippines. 2017. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/8-pns-bafs-201-2017-code-of-good-animal-husbandry-practice-for-goat>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice for Sheep. By Bureau of Agriculture and Fisheries Standard, Philippines. 2017. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/9-pns-bafs-202-2017-code-of-good-animal-husbandry-practice-for-sheep>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice (GAHP) for Poultry Hatchery. By Bureau of Agriculture and Fisheries Standard, Philippines. 2018. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/10-pns-bafs-263-2018-code-of-good-animal-husbandry-practice-for-hatchery>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice (GAHP) for Swine. By Bureau of Agriculture and Fisheries Standard, Philippines. 2019. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/11-pns-bafs-267-2019-code-of-good-animal-husbandry-practice-for-swine>
- PNS (Philippines National Standard) Code of Good Animal Husbandry Practice (GAHP) for Ducks. By Bureau of Agriculture and Fisheries Standard, Philippines. 2019. Available at: <https://bai.gov.ph/gahp/index.php/philippine-national-standards/send/3-gahp-standards/12-pns-bafs-271-2019-code-of-good-animal-husbandry-practice-for-ducks>
- Postpartum Care of Dairy Cattle. By MacDonald Campus Facility Animal Care Committee. Standard Operating Procedure # DC-405, Revision# 02. McGill University. 2013. Available at: [https://www.mcgill.ca/research/files/research/sop\\_dc-405-2\\_post\\_partum\\_care\\_of\\_dairy\\_cattle.pdf](https://www.mcgill.ca/research/files/research/sop_dc-405-2_post_partum_care_of_dairy_cattle.pdf)
- Post-Weaning Period Critical Time for Dairy Heifers. By Donna M. Amaral-Phillips, Department of Animal & Food Sciences, College of Agriculture, Food and Environment, USA. Available at: <https://afs.ca.uky.edu/content/post-weaning-period-critical-time-for-dairy-heifers#:~:text=During%20the%20weaning%20process%2C%20the,is%20removed%20from%20the%20diet.>
- Poultry: Breeder Management. Tamil Nadu Agricultural University. Available at: [http://www.agritech.tnau.ac.in/expert\\_system/poultry/Breeder%20Management.html](http://www.agritech.tnau.ac.in/expert_system/poultry/Breeder%20Management.html)

Present status of rearing backyard poultry in selected areas of Mymensingh district. By MA Alam and co-workers. 2014. Published in Bangladesh Journal of Animal Science, 43 (1): 30-37.

Process of Shoeing of Animals: Need, Procedure and Precautions. By Puja Mandal. Available at: <https://www.yourarticlelibrary.com/dairy-farm-management/process-of-shoeing-of-animals-need-procedure-and-precautions/36479>

Replacement Management in Cattle: Health Management. By S.T. Franklin and J.A. Jackson. In book: Encyclopedia of Dairy Sciences, 2nd edition, 2011, pages 417–420. Published online: 2016. Available at: <https://www.sciencedirect.com/science/article/pii/B9780081005965010350?via%3Dihub>

Risk factors associated with milk fever occurrence in grazing dairy cattle. By A. Saborío-Montero and Co-workers. 2017. Published in: Journal of Dairy Science, 100: 9715–9722. Available at: [https://www.journalofdairyscience.org/article/S0022-0302\(17\)30876-7/pdf#:~:text=Among%20the%20risk%20factors%20that,of%20other%20diseases%20\(increase%20the](https://www.journalofdairyscience.org/article/S0022-0302(17)30876-7/pdf#:~:text=Among%20the%20risk%20factors%20that,of%20other%20diseases%20(increase%20the)

Risk factors of clinical and subclinical endometritis in cattle: a review. By Mounir Adnane and co-workers. 2017. Published in: Turkish Journal of Veterinary and Animal Sciences, 41: 1-11. Available at: <https://dergipark.org.tr/tr/download/article-file/541975>

Scenario of Backyard Chickens Rearing System with Production Performances in Selected Areas of Chittagong District of Bangladesh. By C Prabal. 2012. Available at: [https://www.researchgate.net/publication/235745234\\_Scenario\\_of\\_Backyard\\_Chickens\\_Rearing\\_System\\_with\\_Production\\_Performances\\_in\\_Selected\\_Areas\\_of\\_Chittagong\\_District\\_of\\_Bangladesh](https://www.researchgate.net/publication/235745234_Scenario_of_Backyard_Chickens_Rearing_System_with_Production_Performances_in_Selected_Areas_of_Chittagong_District_of_Bangladesh)

Selecting for Egg Production. By Don Schrider, Communication Director, American Livestock Breeds Conservancy. Published by the Communication Director, American Livestock Breeds Conservancy. In: Chicken Assessment for improving productivity, Chapter 2. Published by the American Livestock Breeds Conservancy, USA. 2007. Available at: [http://www.albc-usa.org/documents/ALBCchicken\\_assessment-2.pdf](http://www.albc-usa.org/documents/ALBCchicken_assessment-2.pdf)

Selecting for Meat Qualities and Rate of Growth. By Jeannette Beranger, Research & Technical Program Manager, American Livestock Breeds Conservancy and Don Schrider, Communication Director, American Livestock Breeds Conservancy. In: Chicken Assessment for improving productivity, Chapter 1. Published by the American Livestock Breeds Conservancy, USA. 2007. Available at: [http://www.albc-usa.org/documents/ALBCchicken\\_assessment-1.pdf](http://www.albc-usa.org/documents/ALBCchicken_assessment-1.pdf)

Selection Methods in Poultry Breeding: From Genetics to Genomics. By Vishesh Kumar Saxena and Gautham Kolluri. 2018. In book: Application of Genetics and Genomics in Poultry Science. Available at: [https://www.researchgate.net/publication/327483824\\_Selection\\_Methods\\_in\\_Poultry\\_Breeding\\_From\\_Genetics\\_to\\_Genomics](https://www.researchgate.net/publication/327483824_Selection_Methods_in_Poultry_Breeding_From_Genetics_to_Genomics)

- Systems of Poultry Breeding. Lesson 18. Visited on 16 August 2022. Available at:  
<https://egyankosh.ac.in/bitstream/123456789/59756/1/Systems%20of%20poultry%20breeding.pdf>
- The Animal and Animal Product Quarantine Act, 2005 of Bangladesh
- The Animal Disease Act, 2005 of Bangladesh
- The Animal Disease Rules, 2008 of Bangladesh
- The Animal Feed Rules, 2013 of Bangladesh
- The Animal Slaughter and Meat Quality Control Act, 2011 of Bangladesh
- The Animal Slaughter and Meat Quality Control Rules, 2021 of Bangladesh
- The Animal Welfare Act, 2019 of Bangladesh
- The Consumers' Right Protection Act, 2009 of Bangladesh
- The Fish Feed and Animal Feed Act, 2010 of Bangladesh
- The Food safety Act, 2013 of Bangladesh
- The Food safety Rules, 2014 of Bangladesh
- The Mobile Court Act, 2009 of Bangladesh
- The potentials of raising Muscovy duck (*Cairina moschata*) in Bangladesh-a review. By S Islam and co-workers. 2020. Bangladesh Journal of Veterinary and Animal Sciences, 8(2):216-224.
- The two phases of young stock management. Chapter 2: Rearing Young Stock on Tropical Dairy Farms in Asia. Available at:  
[https://www.publish.csiro.au/ebook/chapter/9780643107427\\_Chapter2](https://www.publish.csiro.au/ebook/chapter/9780643107427_Chapter2)
- Water Quality. By: UK Ag Extension, Chapter 12, Kentucky Poultry Federation. Available at: <https://afs.ca.uky.edu/files/chapter12.pdf>
- Weaning Management of Buffalo Calves: Challenges and Strategies under Indian Conditions. By P.K. Bharti, Prachurya Biswal and Bhanita Devi. 2020. Available at:  
[https://www.researchgate.net/publication/349767085\\_Weaning\\_Management\\_of\\_Buffalo\\_Calves\\_Challenges\\_and\\_Strategies\\_under\\_Indian\\_Conditions](https://www.researchgate.net/publication/349767085_Weaning_Management_of_Buffalo_Calves_Challenges_and_Strategies_under_Indian_Conditions)
- Weaning strategies to improve productivity and animal welfare in zebu (*Bos indicus*) and water buffaloes (*Bubalus bubalis*). By Agustín Orihuela, Daniel Mota-Rojas and Fabio Napolitano. 2020. Available at:  
<https://jabbbnet.com/article/10.31893/jabb.20036/pdf/jabbnet-8-4-257.pdf>
- Young Stock Management. By: veeproholland. Available at:  
<https://www.veeproholland.com/wp-content/uploads/2021/05/VeeproYoungStockManagementsmall.pdf>
-

## V. VALIDATION OF THE NG-GLPP

- The validation process of the draft ‘National Guidelines on Good Livestock Production Practices’ (NG-GLPP) was a long process that involved several reviews of the document resulting in lots of correction proposals, recommendations and comments, and required about 9 months of time.
- The reviewers were the experts on animal health, animal production and management and on food safety from the DLS as well as from outside the DLS.
- Finally, a validation workshop has validated the correction proposals, recommendations & comments by the reviewers, and provided additional recommendations & comments.
- According to the validation of the correction proposals, recommendations and comments by the reviewers and the additional recommendations and comments from the validation workshop, the writer corrected the draft NG-GLPP and took necessary actions on the recommendations and comments that have been come from the validation workshop.

### A. Core Review Committee (CRC)

First, a six-membered ‘Core Review Committee’ was formed by the DLS led by the Director, Planning of the DLS, **Dr. Malay Kumar Sur** to review, and to provide correction proposals, recommendations and comments on the draft NG-GLPP.

#### **Other members of the CRC:**

Sl. No.	Name of the Members	Designation of the Members
1.	Dr. A. B. M. Khaleduzzaman	Director, Production, DLS, Dhaka
2.	Dr. Sk. Shaheenur Islam	Deputy Chief Epidemiologist Divisional Livestock Department, Dhaka, DLS
3.	Dr. Avijit Kumar Modak	Upazila Livestock Officer (ULO) Leave/Reserve (L/R), Attached to- Planning Section, DLS, Dhaka
4.	Dr. Mohammad Shahadat Hossain	Upazila Livestock Officer (ULO) Leave/Reserve (L/R), Attached to- Planning and Evaluation Cell (PEC), DLS, Dhaka
5.	Dr. B. M. Jafar Ahammed	Upazila Livestock Officer (ULO) Leave/Reserve (L/R), Attached to- Human Resource Development (HRD) Section, DLS, Dhaka

- The CRC members chapter wise reviewed the NG-GLPP and provided necessary correction proposals, recommendations and comments on the document.
- The CRC conducted 5 review meetings with the Livestock Value Chain Consultant of the Bangladesh Trade Facilitation (BTF) project **Dr. Abul Khair** at DLS.
- In these review meetings, the CRC discussed in detail on the proposed corrections, recommendations and the comments provided by the respective reviewers on the draft NG-GLPP, and took decisions whether the proposed corrections, recommendations and the comments are to be accepted or not.
- According to the decisions of the CRC, **Dr. Abul Khair**, Consultant, BTF project corrected the draft NG-GLPP document and took needful actions on the recommendations and comments provided by the reviewers of the committee.

#### **B. Validation Review Committees (VRC)**

- After completion of the correction as per CRC review, recommendations and comments from the members of the Core Review Committee, the DLS formed 6 Validation Review Committees comprising of 3 members in each committee. Validation Review Committees with names of the committee and the members have been mentioned in the Appendix 47.
- The members of these 6 VRCs chapter wise reviewed, and provided corrections proposals, recommendations and comments on the draft NG-GLPP.
- The document chapters were grouped according to the subjects of the guidelines (6 subjectsguidelines, where each subject contains 2 to 3 chapters).
- Each VRC reviewed, and provided corrections proposals, recommendations and comments on each of those 6 subjects of the draft NG-GLPP.
- The chapter wise proposed corrections, recommendations and comments on the draft NG-GLPP provided by the VRCs were taken to be validated and additional recommendations and comments were to be desired from a validation workshop.

#### **C. Validation Workshop (VW)**

- A validation workshop (VW) was organized by the BTF project with the DLS high officials, members of the CRC and that of the VRCs, the representatives of different livestock related professional associations and the stakeholders in the Pan Pacific Sonargaon Hotel, Dhaka on 17 April 2023.

- A total of 54 participants were nominated by the DLS for the VW and total 47 nominees were participated to the VW. The list of the Participants Nominated by the DLS for the VW in the Govt. order (GO) has been presented in the Appendix 48.
- The attended participants were divided into 6 groups (groups have been shown in Appendix 49) according to the VRCs based on the subject of the guidelines. Members of each VRC led the respective groups.
- In the workshop, **Dr. Abul Khair**, Consultant, BTF project shortly presented the guidelines before the participants and narrated the modality of the group works.
- The prime duties of the groups were to validate the chapter wise correction proposals, recommendations and comments provided by the respective VRC and to provide recommendations on dissemination and implantation of the guidelines.
- Members of the groups reviewed the subject wise respective chapters of the guidelines and provided additional recommendations and comments.
- Finally, one member of each group separately presented their validation remarks on the correction proposals, recommendations and comments by the respective VRC.
- The additional recommendations and comments on the draft NG-GLPP, and the recommendations on dissemination and implantation of the guidelines provided by the respective group were also presented in the workshop.
- The presented outcomes of the group works were validated by several logical and scientific questions and answers, suggestion and discussions among the participants and the presenter.
- After the validation workshop, a meeting was arranged by the CRC with the Consultant of the BTF project **Dr. Abul Khair** in the DLS to take decision regarding the validation proposals on the draft NG-GLPP. The meeting took decisions for acceptance of the proposals obtained from the VW.
- According to the decision of the CRC, **Dr. Abul Khair**, Consultant, BTF project corrected the document as per validation proposals on the correction proposals, comments and recommendations on the draft NG-GLPP given by the VRCs, took necessary action on the supplementary recommendations and comments on the document by the validation groups, and incorporated the recommendations on dissemination and implementation of the guidelines among the stakeholders into the draft NG-GLPP.
- Thus, the draft 'National Guidelines on Good Livestock Production Practices (NG-GLPP)' has been validated.

## **CHAPTER I**

### **GENERAL**

#### **1.1. INTRODUCTION**

Livestock and poultry rearing in Bangladesh have proved to be useful tool for poverty alleviation, income generation, reduction of gaps between the demand and supply of animal protein, and thus ensuring the nutrition security. Livestock sub-sector plays an important role in the national economy of Bangladesh with a contribution of around 1.90% to the national GDP, 16.52 % to the agricultural GDP with a growth rate of 3.10% in the national GDP and thus providing 20% of total direct employment (DLS, 2022). In contrast, looking back to 25-30 years, cattle were being totally linked with supportive to land cultivation for cereal grain and cash crop production. Animal farms are very much interlinked to the integrated farming system. Integration of livestock and crops allows for efficient recycling through use of crop residues and by-products as animal feeds and on the other hand, animal manure as crop fertilizer. Smallholder's poultry and dairy farming have great potential due to their scope to provide self-employment to the rural people including many landless and women. In fact, animal farming requires less land, less operational capital and least influenced by the seasonal variation. The sector provides scope for improvement towards integration and higher productivity for poverty alleviation and sustainable livelihood for the landless poor specially for women. In 2021-22 fiscal year, the domesticated animal in Bangladesh were estimated in million heads as 24.70 cattle, 1.51 buffalos, 3.75 sheep, 26.77 goats, 311.80 chickens, and 63.84 ducks (DLS, 2022).

There is a rapid growth in demand of safe and quality animal origin foods (milk, meat and egg) and their value-added products in Bangladesh. The increased demand of safe and quality animal protein has created an opportunity for large investment in the livestock sector. As such, it can accelerate income generation, employment, woman empowerment, and ultimately poverty alleviation. However, the uneven growth over time has threatened the projected rapid production of animal and their products. During the period from 2009-10 to 2021-22 in Bangladesh, the annual production of milk, meat and eggs has increased from 2.37 mill. tons, 1.26 mill. tons and 5.74 billion to 13.07 mill. tons, 9.27 mill. tons and 23.35 billion respectively (DLS, 2016 and 2022), and the per capita availability of milk, meat and eggs were 208.6 ml/day, 147.8 g/day and 136.0 no. eggs/year respectively (DLS, 2022).

Moreover, 'Vision 2041' of Bangladesh aims to eliminate extreme poverty and reach the country to the 'Upper Middle-Income Country' status by 2031, and the 'High-Income Country' status by 2041 with approaching zero poverty (GED-BPC, 2020). To achieve the 'Vision 2041', Bangladesh has set a target of producing 20.0 mill. tons milk, 11.0 mill. tons meat, and 33.0 billion eggs in the 'Perspective Plan of Bangladesh 2021-2041' to meet per capita requirement of 270 ml milk and 150 gm meat/day, and 165 eggs/year by 2031. To achieve the 'Vision 2041' for milk, meat and egg and to meet the per capita requirement of 300 ml milk and 160 gm meat/day and 208 eggs/year in 2041, Bangladesh has also set a goal of producing 30.0 mill. tons milk, 12.0 mill. tons meat, and 46.5 billion eggs by 2041 (GED-BPC, 2020). The number of livestock and poultry farms have to be increased vastly to achieve these target productions of milk, meat and eggs in the future.

Animal production is involved with the care and management of domesticated animals. It includes suitable housing for animals, proper feeding, health care and breeding to obtain expected quantity of quality animals (livestock and poultry), and safe and quality animal products (milk, meat, eggs etc.). Guidelines are general rules, principles or piece of advices, and are something used to define how a judgment or policy is made, or an explanation or a plan to guide one in setting standards or determining a course of action, but the guidelines are not mandatory to abide by the stakeholders. The purposes of guidelines on good animal production practices of the animal facility/farm are to ensure greater confidence of the consumers so the animal products are safe and suitable for human consumption with welfare of the workers and the animals without causing any harm to the environment (DAP, 2019), as the customers demand food safety as a mandatory requirement of the food, and some customers demand other standards related to environment, animal welfare, and workers health and safety (ASEAN, 2015). So, the guidelines on good animal production practices tend to cover animal (livestock and poultry) production practices including animal housing, nutrition, biosecurity measures, animal health management, workers and animal welfare, food safety etc. So, formulation of the 'National Guidelines on Good Livestock Production Practices' (NG-GLPP) becomes urgently necessary for Bangladesh to ensure the production of safe, quality and target quantity of milk, meat and egg as per 'Vision 2041'. On the other hand, it is essential to implement the NG-GLPP correctly at all spheres of livestock and poultry production systems to sustain the animal enterprises and to harmonize animal production practices.

Therefore, the NG-GLPHP would be a valuable document for Bangladesh to harmonize the animal husbandry and production practices, to ensure better food safety and to obtain better quality and quantity of animals (livestock and poultry) and their products. Successful implementation of the NG-GLPP in the animal production system in Bangladesh by forming effective documents, sharing information and mobilizing the communities overcoming the challenges with extending partnership and coordination among the stakeholders in the implementation process of the guidelines will help to reach the Bangladesh livestock sector to the international standard and facilitate export of quality animals and animal products.

## **1.2. Scope of the Guidelines**

The National Guidelines on Good Livestock Production Practices (NG-GLPP) is a standard for good animal production practices in Bangladesh. The NG-GLPP-

- are mainly aimed at good animal production management keeping good animal health and welfare, and at obtain safe and quality animal products (food safety), and
- also covers elements of farm biosecurity and sanitation, workers' health and safety, and measures to reduce environmental impacts.

Because, the global trade of animal and animal products is increasing as trade becomes at liberty. Changes in consumer lifestyles in Bangladesh and throughout the world are driving the demand for assurance that animal products are-

- safe for human consumption,
- produced and handled in a manner that does not compromise the health, safety and welfare of animal and farm workers, and
- not cause harm to the environment.

And the impact of these trends resulted in the increased demands from the retailers for-

- compliance with good animal husbandry practices (GAHP) programs and
- the government introduction of legal requirements for food safety, worker health, animal welfare and environmental safety.

### **1.3. Purpose of the Guidelines**

The purpose of the NG-GLPP are to -

- ensure good animal (livestock and poultry) production practices,
- harmonize of animal production practices in throughout Bangladesh,
- ensure production of healthy animals (livestock and poultry),
- ensure production of safe and quality animal products best suited for human consumption,
- enhance welfare of farm workers and animals,
- help to sustain and improve safe animal origin food supply chain,
- improve viability and sustainability of animal farmers,
- encourage to conserve the environment,
- facilitate domestic and international trade of animal and animal products, and
- enhance competitiveness of Bangladesh to the global markets for animal & animal products.

### **1.4. Definition of Terms**

**1.3.1. Animal:** An animal is a living organism that feeds on organic matter, typically having specialized sense organs and nervous system and able to respond rapidly to stimuli. But in this document, animal means domesticated animals that include livestock (cattle, buffalo, goat, sheep and pig) and poultry (chicken and duck), and is also used as normal sense of animal.

**1.3.2. Livestock:** Livestock are domestic farm animals kept for productive purposes (meat, milk, work, wool) including cattle, sheep, horses, goats, pigs and other domestic animals ordinarily raised or used on the farm. But in this document, livestock includes cattle, buffalo, goat, sheep and pig.

**1.3.3. Poultry:** Poultry are birds including chickens, ducks, turkeys, and geese raised commercially or domestically for meat, egg, and feather production. But in this document, poultry includes only chicken and duck.

**1.3.4. Animal rearing facility/rearing facility:** Animal rearing facility/rearing facility means any animal rearing establishment other than farming system like backyard rearing system.

**1.3.5. Facility/Facilities:** Slaughterhouses, meat selling centers and meat processing plants are referred as facility/facilities in this document.

**1.3.6. Biologics:** Biologics are those biologics that are used in animal only like vaccines for livestock and poultry for prevention of diseases.

**1.3.7. Farm:** Farm means livestock and poultry farms that mentioned in this document.

**1.3.8. Guidelines:** Guidelines means the National Guidelines on Good Livestock Production Practices (NG-GLPP).

**1.3.9. Notifiable diseases:** A notifiable disease is any disease that is required by law to be reported to government authorities.

**1.3.10. Body condition score (BCS):** Body condition scoring is a management tool designed to assess the body reserves or fat accumulation of an animal. It is a hands-on assessment method for critically examining the nutritional status of an animal and a herd. A 5-point scale is generally used when scoring cattle, small ruminants, swine and elk- 1 is assigned to an extremely emaciated animal and 5 is assigned to an extremely fat or obese animal. However, horses are typically scored using a 9-point scale.

**1.3.11. Shall be:** 'Shall be' is used in such cases where any practice, process or procedure etc. is mandatory to do as the described way(s) or manner(s).

**1.3.12. Should be:** 'Should be' is used in such cases where one should do any practice, process or procedure etc. as the described way(s) or manner(s), but not mandatory.

**1.3.13. Could be or Can be:** 'Could be' or 'Can be' is used in such cases where one can do any practice, process or procedure etc. as the described way(s) or manner(s), but not should to do and not mandatory.

**1.3.14. Might be or May be:** 'Might be' or May be is used in such cases where one may do any practice, process or procedure etc. as the described way(s) or manner(s), but not can to do, not should to do and not mandatory.

## CHAPTER II

### PRESENT ANIMAL PRODUCTION PRACTICES IN BANGLADESH AND IN THE WORLD

#### 2.1. Present Animal Production Practices in Bangladesh

##### 2.1.1. Farm Classification Based on Land Use and Animals Concentration

###### 2.1.1.1. Extensive Farming or Free-Range Farming System

This is the oldest system of animal rearing and needs adequate land. Free-range means a system of keeping animals in which they can move and feed freely on an area of open ground. A range should provide shelter, greens, feed, water, shade etc. Foraging is a major source of feeding for animals in this system. Shelter is usually provided by temporary roofing supported by ordinary poles. This system is used on large non-cultivated land where animals can graze freely and is mainly chosen for cattle, buffalo, sheep and goats. Extensive or free-range system of animal production is most common in the backyard system of animal rearing, especially poultry production in Bangladesh. Free ranging animal rearing is also observed in the coastal areas and 'char lands' of Bangladesh, where cattle, buffalo, sheep and a few goats are reared. A large number of ducks are reared free ranging in some Haor areas of Bangladesh.

###### 2.1.1.2. Semi-intensive Farming

This system is commonly used by small scale producers. Animals are half way reared in houses and half way on ground or range. Houses are simple houses with thatched roof to provide shade and protection from bad weather and predators, and with earth, paved or slatted floor (for poultry, goat, sheep and pig). Semi-intensive animal production is also found in the backyard production system in the rural and semi-urban areas of Bangladesh.

###### 2.1.1.3. Intensive Farming

Intensive farming system is also known as "landless" farming in heavily populated areas, where the demand for protein is very high. This is the most generally recognized farming system used in Bangladesh like global scenario. Animal production in the large-scale farms using intensive system, sometimes is referred as 'industrial animal production'. The industrial animal production is found in case of large-scale poultry farming in Bangladesh.

Although beef and dairy cattle, sheep and goat, and even buffalo can be reared in the intensive farming system. Most of the smallholders' and all of the large-scale and industrial animal producers are producing animals by intensive farming in Bangladesh.

## **2.1.2. Farm Classification Based on Nature and Purpose**

### **2.1.2.1. Backyard/Household System of Animal Production**

To support the household economy and to ensure family protein supply, most of the rural peoples are generally rearing chicken, ducks, goats and cattle in their households in Bangladesh. In the urban areas of Bangladesh, a few people are rearing chicken or cattle in their households. Almost all the rural households have the ownership mainly of chickens and more than half of the households also owned cattle, goats or ducks (Roess *et al.*, 2013). Total 41.93% households of Bangladesh were rearing cattle (BBS, 2019) and most poultry were left to range by day and placed in baskets at night (Roess *et al.*, 2013). Women are mostly engaged in the backyard/household system of animal rearing in Bangladesh. This system helps in income generation and women empowerment.

### **2.1.2.2. Free Ranging Animal Production**

Free ranging denotes a method of animal production where the animals, for at least part of the day, can wander freely outdoors. Free ranging animal production practices are generally observed in the coastal areas, Char lands, Haor/Bil and also in the plain and highland areas of Bangladesh where grazing land is available. Mainly buffalo and sheep and a few cattle and goats are reared under free ranging system in the coastal areas of Bangladesh. A few peoples of some ethnic groups of Bangladesh are seen to rear pigs in free ranging system. The peoples of Haor areas of Bangladesh are rearing a large number of ducks in a free ranging system. Only 3% percent farmers reared their cattle by free ranging system in Bangladesh (Rahman *et al.*, 2013) and 12.2% farmers are rearing goats in free ranging in the southern part of Bangladesh (Hossain *et al.*, 2015).

### **2.1.2.3. Farming System Animal Production**

The farming system animal production in Bangladesh is mainly commercial and traditional farming. About 80% farmers rear cattle by semi-intensive system and 17% by intensive system in Bangladesh (Rahman *et al.*, 2013). Almost all commercial farmers rear their

poultry using intensive system. According to the Department of Livestock Services (DLS), Bangladesh, generally there are two types of animal farming are available in Bangladesh for commercial purpose, such as: a) Smallholder’s farming and b) Large scale farming. Most of the large-scale livestock and poultry farmers are rearing their animals by intensive system and that intensive large-scale farming can be referred as ‘Industrial Animal Production’ as mentioned earlier.

### 2.1.3. Farm Classification as per the DLS Definition

The DLS, Bangladesh has classified livestock and poultry farms into 4 categories (Category A, B, C and D). The category A, B and C can be classified as large-scale and the category D as smallholders’ farm. The farms of the cattle, buffalo, goat, sheep and the pig (as livestock) and that of the chicken and the duck (as poultry) are mentioned in the list below from all of the animal farms of the DLS classification, because the cattle, buffalo, goat, sheep and the pig (as livestock), and the chicken and the duck (as poultry) are considered in this document. The DLS categories of livestock animal farms are as follows:

Class A		Class B	
1. Dairy and fattening farm (cattle/buffalo):	≥ 51;	1. Dairy and fattening farm (cattle/buffalo):	21 - 50;
2. Goat, sheep and pig farm:	≥ 61;	2. Goat, sheep and pig farm:	41 - 60;
3. Chicken farm (parent stock):	≥ 20,001;	3. Chicken farm (parent stock):	10,001 - 20,000;
4. Chicken farm (layer/broiler/Sonali):	≥ 20,001;	4. Chicken farm (layer/broiler/Sonali):	10,001 - 20,000;
5. Duck farm:	≥ 20,001.	5. Duck farm:	10,001 - 20,000.
Class C		Class D	
1. Dairy and fattening farm (cattle/buffalo):	11 - 20;	1. Dairy and fattening farm (cattle/buffalo):	3 - 10;
2. Goat, sheep and pig farm:	21 - 40;	2. Goat, sheep and pig farm:	5 - 20;
3. Chicken farm (parent stock):	1,001 - 10,000;	3. Chicken farm (parent stock):	101 - 1,000;
4. Chicken farm (layer/broiler/Sonali):	1,001 - 10,000;	4. Chicken farm (layer/broiler/Sonali):	101 - 1,000;
5. Duck farm:	1,001 - 10,000.	5. Duck farm:	101 - 1,000.

## **2.2. Present Animal Production Practices in the World**

Global animal production systems are classified mainly based on land, type of crop production, climatic conditions, location and technology used in the crop production. The scale, purpose and nature of animal farming is known as the 'animal production system'. FAO, 2021 described the following livestock production systems for the Asia and Pacific and this is the scenario of almost all parts of the world.

### **2.2.1. Land-Based Animal Production System**

In this system, > 90% of dry matter (DM) fed to animals comes from rangelands, pastures, annual forages and purchased feeds, and < 10% of the total value of production comes from non-animal farming activities.

### **2.2.2. Mixed-Farming Animal Production System**

In this system, > 10% of the DM fed to animals comes from crop by-products or stubble, or > 10% of total value of production comes from non-animal farming activities.

### **2.2.3. Feedlot System**

This production system is defined by the use of ruminant species, principally beef cattle, where feed is mainly introduced from outside the farm. The system is based on high-producing, specialized breeds and their crosses. The system is feed- and labor-extensive, and key efficiency parameters are daily weight gains and feed conversion rate (FCR).

### **2.2.4. Backyard Animal Production System**

In the backyard system monogastric species, mainly poultry and pigs are reared and the animals are usually confined in simple structures, often within the homestead and fed with some feed supplement. Generally, family labor suffices for production activities. Based on the family consumption and sale of the animal products, FAO, 2021 classified the backyard animal production system into other 2 classes, such as,

#### **2.2.4.1. Semi-Commercial Animal Production System**

This system is defined by the use of monogastric species, mainly chickens and pigs, where up to 50% of the value of production is for home consumption.

#### **2.2.4.2. Commercial Animal Production System**

This system is defined by the use of monogastric species, mainly chickens and pigs, where over 50% of livestock products are for sale.

---

# **NATIONAL GUIDELINES ON GOOD LIVESTOCK PRODUCTION PRACTICES (NG-GLPP)**

---

## **CHAPTER III**

### **REQUIREMENTS OF ANIMAL OWNER/FARM MANAGER/WORKER AND COMPONENTS OF ANIMAL FARM/ANIMAL REARING FACILITY**

#### **3.1. Skills & Competencies Required for Animal Owner/Farm Manager/Worker**

- a) The farm owner, manager and farm workers should undergo training on the necessary knowledge and skills about the basic procedures of the farm management including-
  - 1) proper animal handling and welfare,
  - 2) feeding management,
  - 3) primary animal health management,
  - 4) medicine and biologics dispensing, administration and application,
  - 5) animal breeding and artificial insemination (AI),
  - 6) usage of farm tools and equipment,
  - 7) quarantine and isolation practices,
  - 8) biosecurity,
  - 9) pasture and forage development and management,
  - 10) waste management,
  - 11) other routine farm management practices,
  - 12) recording and record keeping, and
  - 13) updated laws, policies and guidelines regarding animal farming.
- b) Farm manager and workers should be competent in the tasks that they are required to do and their competencies should be reviewed on a regular basis.
- c) The farm should have sufficient number of necessary staffs.

## **3.2. Components of Animal Farm/Animal Rearing Facility**

### **3.2.1. Location of Farm/Animal Rearing Facility**

The location of both the livestock and poultry farms/rearing facility, if not otherwise specified, should-

- a) be in a comparatively highland or place that is not prone to flooding.
- b) have adequate land that would be sufficient to establish all farm components.
- c) have enough space to provide housing and scavenging in case of backyard system.
- d) have sufficient pasture land for grazing livestock and/or to produce forage for livestock.
- e) have good communication with road/railway/waterway/airway.
- f) have a supply of suitable electrical power and safe potable water (water must be tested for safe potable water before selection of the location).
- g) have facilities of manure and farm waste disposal.
- h) be on site with a logical distance from human dwelling other than of backyard rearing.
- i) be accessible to major production facilities (i.e. feed mill, water system, forage area, veterinary services etc.).
- j) not be close to water bodies and wetlands that are frequented by migratory birds.
- k) not be near a slaughterhouse or other animal facilities, biological laboratory, noise producing factory, chemical industry, sewage disposing area or highway.
- l) not be on a site that could be a source of physical, chemical, biological and radiation hazards (soil must be tested for physical, chemical, biological and radiation hazards before selection of the location).
- m) not be near wild animal habitat.

### **3.2.2. Layout of Farm/Animal Rearing Facility**

The layout of both the livestock and poultry farms, if not otherwise specified, should-

- a) have the facilities for executing a standard animal production activity with appropriate application of hygiene, sanitation and biosecurity measures.
- b) have a proper design for animal sheds as required with necessary distance from each other.
- c) have an acceptable space for brooding and growing houses for poultry in a safe distance from the resident stocks.

- d) have an acceptable space for maternity, parturition, milking and dry off facilities, and separate neonate and growing stock sheds for the livestock farming, where applicable.
- e) have adequate facilities for collection, preparation and primary processing of animal product (milk or egg), where applicable.
- f) have a suitable area-set aside for feed and animal product storage, quarantine and isolation, carcass disposal, waste disposal, workers area with washrooms, change room for workers and visitors etc.
- g) have an area for veterinary clinic near the isolation shed/area with a primary diagnostic facility in a buffer distance from the resident animal sheds in case of large-scale farms.
- h) have a design with adequate feed and water supply facilities, and ease of cleaning.
- i) have facility for electrical conduits installation with covering to prevent electrocution.
- j) have pasture facilities with irrigation, and drinking water and shades for the animals.
- k) have good drainage facilities both in the farm areas as well as in the pastures.
- l) have adequate facilities for making silage in the livestock farms.
- m) have a good internal road network for easy and swift movement in large scale farms.
- n) have acceptable spaces for free ranging and scavenging for extensive rearing.
- o) have boundary fences/walls to prevent from animal escaping, predators, theft, contact with other animals, stray, pets and wild animals, and potential disease carriers.
- p) have arrangement for essential safety facilities to combat losses from fire and other emergencies in the large-scale farm, such as required number of fire hydrants to get sufficient water and fire extinguishers etc. when fire onsets.
- q) place the layout in the most visible place for emergency procedures in the large farm.

### **3.2.3. Animal Housing and Housing Facilities**

#### **3.2.3.1. General Guidelines**

##### **3.2.3.1.1. Animal Housing**

- a) The farm should have a well-defined design, infrastructure, facilities, equipment, tools and appliances for an effective and functional operation of the farm.
- b) Housing should be designed and constructed correctly for the intended purpose.
- c) Housing should provide proper ventilation and light (natural/artificial) and be well maintained for a conducive environment for the animals and their production capability.

- d) The housing should provide protection for the farm animals with facilities to prevent animals from escaping, predators, theft, contact to other animals, stray, pets and wild animals, and from potential disease carriers.
- e) Animal houses should be constructed in such orientation that will minimize the adverse effects on animal performance and eliminates possible hazards.
- f) The houses for free ranging animals should be a standard for that animals and built to protect animals from adverse climate and predators.
- g) Houses should have standard height from the floor to the roof to allow adequate air space as per species, breeds & strains of animals to maintain their normal physiological functions and production.
- h) Design for the walls or partitions and roofs of the animal houses should be suitable for the comfort of the animals with easy cleaning facilities.
- i) Gates/doorways should allow free passage for entry and exit so as not to cause injury to the animals and the farm workers.
- j) Painting materials used in the housing & facilities should not be harmful to the animals.
- k) The animals should be provided with sufficient floor space suitable as per species, breed, strain, age, sex, and size & body weight to ensure their comfort and production.
- l) There should be an effective drainage system in place at the housing.
- m) The feeding and drinking equipment and facilities should be well-defined designed, built and visibly placed to allow animals to eat and drink freely and to behave normally.
- n) The feeding and drinking facilities should conform with the requirements for the species, breed, strain, age, sex, and size and body weight of the animals.
- o) Animals should be allowed correct feeder and drinker space to feed and drink easily.
- p) Location and design of feeder and drinker should help to prevent from contamination of feed and water with animal feces and urine.
- q) Electrical installations and wirings should be protected to prevent electrocution and as per designed by the authorized person.
- r) The farm should provide effective and suitable facilities for restraining and handling of animals without causing undue stress and injury to the animals and the farm workers.
- s) The houses and premises should have facilities that allow it to keep clean at all times to prevent from disease and pests, and to avoid environmental decay and pollution.

**3.2.3.1.2. Housing Facilities**

- a) The farm should have a facility for proper storage of all feed materials.
- b) The feed storage should have adequate ventilation, protection from moisture to prevent acquisition of molds, and be pest and vermin-proof.
- c) The feed storage should have facility to practice the “first in-first out” rule, if applicable.
- d) The farm should have storage facilities for animal products, preferably cool rooms with adequate facilities for cleaning and disinfecting.
- e) The farm should have facility for primary preparation and processing of animal products, such as egg cleaning and washing, milk chilling, butter extraction from milk etc., where applicable.
- f) The farm should have correctly designed breeding facility and equipment to provide the animals a comfortable and conducive environment for their reproduction.
- g) The farm should have environment friendly facility for manure and farm wastes disposal.
- h) The boundary surrounding the farm including its gates should be effectively designed to prevent animals from theft, predators, escaping or injury, and entry of stray animals.

**3.2.3.1.3. Materials to be Used for Animal Housing and Housing Facilities**

Materials to be used for housing and facilities-

- a) should not cause any injury to the animals or carry hazard to the welfare of the animal;
- b) provide comfort to the animals;
- c) can easily be cleaned and disinfected;
- d) can easily be replaced when damaged;
- e) create efficient stock management; and
- f) enhance bio-security.

**3.2.3.2. Poultry Farms/Poultry Rearing Facilities**

In addition to the general guidelines for ‘Animal Housing and Facilities’, the farm owner/ manager of the poultry farms/rearing facilities should follow the guidelines for housing and facilities as mentioned below:

**3.2.3.2.1. Poultry Housing**

- a) Houses should have facilities of deep litter, slatted, litter cum slatted floor or cages.
- b) The solid floors for poultry should have deep litter with organic materials to get protection from the cold and for their comfort.
- c) The houses should have facilities for age-wise standard lighting system to ensure that the birds can thoroughly be inspected as required and to ensure proper lighting program.
- d) In the environment control house (ECH) for poultry, all requirements (temperature, ventilation, relative humidity, light etc.) should be maintained at optimum level as the bird's required according to their species, breed, strain, age and sex.

**3.2.3.2.2. Poultry Housing Facilities**

- a) Ancillary houses for brooding and growing stocks should be provided separately in different houses with a safe distance from the resident stocks.
- b) The large-scale poultry farms should have well equipped veterinary clinic with primary disease diagnosis facilities.
- c) The run should be constructed in such a way that it will provide sufficient ventilation, adequately protect the birds from adverse climatic conditions, escaping, predators, pet, stray, and wild birds and animals.
- d) Floor of the run should be flat and well-drained to provide good footing of the birds.
- e) The run should have sufficient floor space for birds to prevent overcrowding, and exact facilities to feed and drink easily and to permit segregation of birds when necessary.

**A. Specific for Ducks**

*1. Outdoor management (Shelter and run for ducks raised outdoors)*

- a) Outdoor management should include shelter and run (an outdoor area) for ducks.
- b) All ducks must have access to shelter from adverse weather and predators.
- c) Shelter openings must be wide enough for ducks to move freely to and from the outdoors at all times without the risk of restriction or injury.
- d) Required numbers of feeders and waterers must be provided in the run, but the feeder should be under a protection so that it can prevent rain to get into the feeders.

- e) Bell drinkers and/or nipple drinkers can be provided in the run to supply drinking water in the outdoor management system of ducks.
- f) The run and the shelter must be managed to prevent from development of mud, dust and/or contamination so that not to become harmful to the ducks.
- g) Precautions must be taken to protect ducks from pests and predators.

## *2. Open water facilities*

- a) Ducks must have access to open water facilities that allow access as early as possible, but in no case, before 1 month of age.
- b) Open water facility may include natural (pond or other water bodies), or artificial (small pond like water facility made of rubber or soft plastic) water facility.
- c) An artificial open water facility must be-
  - 1) fit for the purpose and designed to minimize water spillage;
  - 2) designed and managed so as not to cause harm to the ducks; and
  - 3) constructed from materials that is not harmful or cause harm to ducks by breaking, forming rough or sharp edges.
  - 4) emptied and cleaned regularly.
- d) Open water facilities must be designed and managed to enable the ducks to enter and exit the water freely and easily.
- e) must be designed and managed to ensure all ducks can freely and fully submerge their whole body in the water, and take water up by the bill.
- f) Ramps should be placed within the facilities to help young ducks to exit the water.
- g) Bell drinkers and/or nipple drinkers can be provided in the artificial open water facilities to supply drinking water as an alternative arrangement of water source.
- h) Natural open water facilities must have arrangements of controlling the ducks from going away from the farm area.

### **3.2.3.3. Livestock Farms/Livestock Rearing Facilities**

In addition to the general guidelines for 'Animal Housing and Facilities', the farm owner/manager of the livestock farms/rearing facilities should follow the guidelines for housing and facilities of livestock farms/rearing facilities as mentioned below:

**3.2.3.3.1. Livestock Housing**

- a) The houses for cattle and buffalo should be designed and constructed as per particular type of rearing systems (e.g., tie stalls, free stalls, loose housing, pasture systems etc.).
- b) The floor for large animals should be solid, rough, slopped to the outside and be with herringbone brick soling or concrete-cement (CC) with appropriate drainage facilities.
- c) The floors and pathways to be used by the livestock should be made from non-slippery materials, safe, stable and well-lighted to prevent injury to the animals.
- d) Alleys and chutes should be well designed for effective management and they should-
  - 1) have a proper floor to provide good footing to prevent slippage and injuries.
  - 2) have sides of sufficient height to prevent animals from falling or jumping off.
  - 3) be free from protruding objects or structures (e.g. nails and bolts) that may cause injury to the animals and farm workers.
- e) The houses for sheep, goats and pigs should be with deep litter on solid floor, slatted floor, or litter cum slatted floor.
- f) The solid floors for livestock should have bedding with organic materials to get protection from cool and for their comfort.
- g) Houses should have suitable lighting to ensure thorough inspection of animals as needed.
- h) In the ECH for sheep, goat and pigs, all requirements (temperature, ventilation, relative humidity, light etc.) should be maintained at optimum level as required for the animals according to the species, breed, body weight, size, age and sex.

**3.2.3.3.2. Livestock Housing Facilities**

- a) Housing should be provided separately for lactating, maternity and dry off animals, and weaned, young and growing stocks in different houses.
- b) Milking facilities for dairy animals are composed of milking parlor and milk storage with suitable milking equipment and tools, and maintained in good condition and clean.
- c) Milking facilities should have appropriate amenities of milk carrying and have sufficient facilities for cleaning and disinfecting the milking facilities.
- d) The livestock farm should have holding yard/paddock for animals especially for weaned, young, growing and dry off stocks, in case of those species where necessary.
- e) The holding yard should be constructed in such a way that it will adequately protect the livestock from adverse climatic conditions and will provide sufficient ventilation.

- f) The yard floors should be flat (and well-drained) to provide good footing and to prevent slipping or tripping of the livestock.
- g) The holding yard should have proper facilities for livestock to feed and drink easily.
- h) Sufficient floor space should be provided to prevent overcrowding and to permit necessary segregation of the livestock.
- i) The large farm should have veterinary clinic with key diagnostic facilities for livestock.

## CHAPTER IV

### SELECTION OF BREEDS AND INDIVIDUAL ANIMALS FOR REARING

#### 4.1. Selection of Breeds and Individual Animals for Rearing

- a) The breeds of livestock and poultry could be selected and obtained from their local, exotic and crossbred breeds that are presently available in Bangladesh.
- b) The selected locally available livestock and poultry breeds could also be obtained through using their breeding inputs like semen and embryos in case of livestock, and fertile eggs and semen in case of poultry.
- c) The breeds of livestock and poultry could also be selected from outside Bangladesh and be obtained by importing the livestock and poultry of the selected breeds with the permission from the competent authority.
- d) In case of livestock, dam and sire (pure breeding bull/buck/ram/boar), semen and embryos, and in poultry, day old duckling (DOD), and day old chick (DOC; of parent stock and grandparents), fertile eggs and semen of the selected breeds could be imported with permission from the DLS.
- e) Individual animal should be selected based on age, health conditions, body condition score (BCS), adaptability to the climatic conditions, productivity and performance, longevity, food conversion rate (FCR), reproductive parameters, disease resistance etc.
- f) Import process for livestock must follow the provisions of 'The Animal and Animal Product Quarantine Act, 2005' of Bangladesh.
- g) Both the imported and locally obtained livestock and poultry breeds should have proper and detailed documentation from the competent veterinary authority of the exporting country and Bangladesh respectively.

#### 4.1.1. Poultry

##### 4.1.1.1. Chicken

##### 4.1.1.1.1. Selection of Chicken Breeds for Rearing

Breeds of chicken in Bangladesh are:

- a) Indigenous breeds: Nondescript Deshi (Deshi), Naked Neck, Aseel, Hilly;
- b) Exotic breeds: White Leghorn (WL), Rhode Island Red (RIR), Fayoumi, Australorp, White Cornish (WC), Layer (Hybrid for egg) and Broiler (Hybrid for meat)

- c) Crossbred breeds: WL × Deshi, RIR × Deshi, Deshi × RIR, Fayoumi × Deshi, Deshi × Fayoumi, Australorp × Aseel, Fayoumi × WL, Fayoumi × RIR, RIR × Fayoumi (Sonali), RIR × Naked Neck, WL × Naked Neck, Aseel × Australorp, WC × Deshi.

- (Bhuiyan, 2014)

**Notes:**

1. The Nondescript local breed is commonly found in almost all areas, Naked Neck and Aseel breeds are sporadically found in few areas, and Hilly and Red jungle breeds are found to rear in Chattagram Hill districts, some areas of Chattagram of Bangladesh.
2. The exotic breeds are not well adapted to the climatic conditions of Bangladesh except Fayoumi, so they are not suitable for the extensive system of rearing in Bangladesh.
3. The exotic breeds, such as Fayoumi, and cross breed, such as Sonali (RIR cocks & Fayoumi hens) are successfully rearing under the extensive system in Bangladesh.
4. The exotic layer (Hybrid for egg) and broiler (Hybrid for meat) breeds are commercially successful under the intensive system of rearing in Bangladesh.
5. Presently, the crossbred chickens, except Sonali, and exotic breeds, except layer (Hybrid for egg) and broiler (Hybrid for meat), are not easily available in Bangladesh.

However, the chicken breeds that could be reared in Bangladesh under the extensive, semi-intensive or the intensive system of rearing are as follows:

A. Extensive or semi-intensive system:

1. Exotic breed-
  - a) For egg production: Fayoumi
2. Local/indigenous breed- (Extensive system is suitable)
  - a) For dual purpose (egg and meat): Nondescript local chicken breeds
  - b) For meat production: Naked Neck, Aseel, Hilly
3. Crossbreds breeds-
  - a) For egg production: Fayoumi × WL, WL × Deshi, Fayoumi × Deshi, Deshi × Fayoumi, WL × Naked Neck
  - b) For dual purpose (egg and meat): RIR × Deshi, Deshi × RIR, Fayoumi × RIR, Sonali (RIR × Fayoumi), RIR × Naked Neck
  - c) For meat production: Australorp × Aseel, Aseel × Australorp, WC × Deshi, Sonali

B. Intensive or semi-intensive systems:

1. Exotic breed-
  - a) For egg production: White Leghorn (WL)
  - b) For dual purpose (egg and meat): Rhode Island Red (RIR)
  - c) For meat production: Australorp, White Cornish (WC)
2. Cross breed-
  - a) For meat production: Sonali

C. Intensive systems:

1. Exotic breed-
  - a) For egg production: Layer (Hybrid for egg)
  - b) For meat production: Broiler (Hybrid for meat)

Therefore, the animal owner/farm manager should select the following breeds of chicken for his intended purpose and rearing system to rear in Bangladesh.

1. Fayoumi for egg production and Sonali for dual purpose to rear in the backyard, and under the extensive and semi-intensive system.
2. The Hybrid layer for commercial egg production and Hybrid broiler for commercial chicken meat production to rear under the intensive system.

**4.1.1.1.2. Selection of Day-old Chick (DOC) and Replacement Pullet for Rearing**

- a) The animal owner/farm manager should buy day-old chicks or replacement pullets for rearing chicken or chicken farming.
- b) However, procurement of day-old chick (DOC) is the predominant practice in both the layer and broiler chicken farming in Bangladesh.
- c) The animal owner/farm manager should check the following selection criteria of DOC and replacement pullets prior to purchasing them for rearing.

**A. Day-old Chick (DOC)**

Day-old chick (DOC) should have-

1. record of higher egg production for layer and higher meat production for broiler,
2. body weight not less than 35g for layer and 38g for broiler chick prior to boxing,
3. body length not less than 18cm for layer and 19cm for broiler chick prior to boxing,

4. upright position and free from any infection,
5. body with good conformation and free from any physical defect,
6. a good reflex and should stand up within 3 seconds when a chick laid on its back,
7. clean, open and shiny eyes, but not dull or closed,
8. clean beaks with closed nostrils without red spots on the beak or any malformations,
9. closed and clean navel, but not with remnants of yolk or open,
10. normal colored feet, but not swollen, warmer than normal or no red hocks,
11. fairly even wings and feather growth throughout the body in all the chicks,
12. soft and malleable stomach, but not hard,
13. soft and well hydrated skin,
14. dry and shiny down, but not wet and gummy,
15. uniform size of all chicks, but more than 20% too light or too heavy is not acceptable,
16. 40°C vent temperature after 2-3 hours of arrival, and
17. a non-stressful happy chirp.

**Note:**

The selected DOC must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule in the hatchery as well as after arrival.

**B. Replacement Pullets**

Replacement pullets should-

1. have record of higher egg production,
2. be a sexually mature,
3. be at the age of 12 to 20 weeks,
4. have body weight of 1200 to 1500g at the age between 12 to 20 weeks,
5. be strong and stout with good body conformation, and free from any physical defect,
6. be free from infectious and metabolic disease including osteomalcia and osteoporosis,
7. have bright red and full comb,
8. have well aligned beaks and not have any discharge from the nostrils,
9. have glossy, tight, good sheen feathers, but not broken feather or worn coverings,
10. have bright and curious eyes, but no deformed pupils,
11. have a golf ball sized crop,

12. have smooth legs, but no raised scales on legs,
13. have clean, pink, bright and glossy vent, and
14. be active, unruly, energetic and vibrant.

**Note:**

The selected replacement pullets must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

**4.1.1.2. Duck**

**4.1.1.2.1. Selection of Duck Breeds for Rearing**

Breeds of duck in Bangladesh are:

- a) Indigenous breeds: Nondescript Local, Deshi White, Deshi Black,  
Sylhet Mete, Nageshwari, Muscovy (Cina hanh);
- b) Exotic breeds: Khaki Campbell, Indian Runner, Jinding, Muscovy (Cina hanh),  
White Pekin, Cherry Valley, Thailand Black;
- c) Crossbred breeds: Indigenous × Exotic breeds.

- (Bhuiyan, 2014)

As all locally available duck breeds have adapted well to the local climatic conditions, they could be reared in Bangladesh under extensive or semi-intensive systems for a particular purpose i.e., for egg or meat, or egg and meat production.

Hence, the duck breeds that could be reared under the extensive or semi-intensive system of rearing in Bangladesh are as follows:

Extensive system or semi-intensive:

1. Exotic breeds-

- a) For egg production: Khaki Campbell, Indian Runner, Jinding,  
Sylhet Mete and Nageswari
- b) For dual purpose (egg and meat): Pekin and Cherry Valley Ducks\*

(\*Cherry Valley Ducks are, in fact, Pekin Ducks and is actually the commercial name for duck bred by Cherry Valley Farms Ltd. of the UK. Ducklings are sold around the world from the farm for meat and egg production.)

- c) For meat production: Muscovy (Cina hanh)

2. Indigenous breeds (Extensive system is suitable)-
  - a) For dual purpose (egg and meat): Nondescript Local, Deshi White, Deshi Black
3. Crossbred breeds-
  - a) For dual purpose (egg and meat): Indigenous × Exotic breeds

However, duck rearing under the intensive rearing system is still not known to be profitable in Bangladesh, so this system of rearing of duck is not mentioned above. Therefore, the animal owner/farm manager should select the following breeds of duck for his intended purpose and rearing system to rear in Bangladesh.

1. Khaki Cambell is the best, Indian Runner is the second and then the Jinding breeds of ducks for egg production under the extensive and semi-intensive system of rearing.
2. Pekin is for dual purpose under the extensive and semi-intensive system.
3. Muscovy is the only meat breed duck for rearing under the extensive and semi-intensive system of rearing.

#### ***4.1.1.2.2. Selection of Day-old Duckling (DOD) and Mature Duck before Laying for Rearing***

- a) The animal owner/farm manager should buy day-old duckling (DOD) or mature duck before starting rearing ducks or duck farming.
- b) However, procurement of DOD is the main practice in duck farming in Bangladesh.
- c) The animal owner/farm manager should check the following selection criteria of the DOD and the mature ducks before starting to purchase them for rearing.

#### **A. Day-old Duckling (DOD)**

A day-old duckling (DOD) should have-

1. record of good egg production for layer breed and meat production for meat breed.
2. body weight not less than 38g for layer and 40g for meat breed duckling prior to boxing.
3. upright position and free from any infection.
4. body with good conformation and free from any physical defect.
5. clean, open and shiny eyes, but not dull or closed.
6. clean bills without any malformations.
7. closed and clean navel, but not with remnants of yolk or open.
8. strong webbed feet, normal colored feet, but not swollen, warmer than normal.

9. fairly even wings and feather growth throughout the body in all the duckling.
10. soft a malleable stomach, but not hard.
11. soft and well hydrated skin.
12. dray and shiny down, but not wet and gummy.
13. uniform size of all chicks, but more than 20% too light or too heavy is not acceptable.
14. a non-stressful happy chirp.

**Note:**

The selected DOD must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule in the hatchery as well as after arrival.

**B. Mature Duck before Laying**

A mature duck (DOD) should-

1. have a record of good egg production for layer and good meat production for meat breeds,
2. be a sexually mature,
3. be at the age of 15 to 20 weeks,
4. have body weight of 1300 to 1800g at the age of 15 to 20 weeks,
5. have bright and curious eyes, but no deformed pupils,
6. have a flat crop, and clean, bright and glossy vent,
7. have a good body conformation free from defects with strong and stout appearance,
8. have a compact and oval body, which is efficient for streamlined swimming and preserving body heat when immersed under water,
9. have wide, strong webbed feet (toes connected by a membrane) that help them be powerful, efficient swimmers and in many cases, agile diver,
10. have well developed talons (sharp hooked claws at the end of the toes) that help the birds grip different surfaces,
11. have bright colored legs and feet (yellow, orange, pink, or red) without loose scaling,
12. have typical broad and somewhat flattened clean, well aligned and shiny bill without any discharge from nostrils to function as a more efficient food scoop or strainer,
13. have a typical set of legs far back on their body, which makes them inconvenient on land but gives them more power when swimming and diving.
14. have well-constructed and thoroughly insulated plumage (feathers with their design and color) that is designed from regular preening (way of grooming),

15. have developed oil gland/preen gland near the tail,
16. have shiny breed characteristic color of plumages covering the whole body,
17. be a good feed-intaking bird with excellent FCR,
18. be vocal as per the breed characteristics,
19. be free from diseases and physical defects, and
20. be active, unruly, energetic and vibrant.

**Note:**

The selected mature ducks must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

## **4.1.2. Livestock**

### **4.1.2.1. Cattle**

#### **4.1.2.1.1. Selection of Cattle Breeds for Rearing**

Cattle breeds that are available in Bangladesh are:

- a) Indigenous breeds: Nondescript local cattle (Deshi), Red Chittagong, Pabna, North Bengal Grey, Madaripur and Munshigonj cattle;
- b) Exotic breeds: Jersey, Holstein-Friesian, Sahiwal, Australian Friesian Sahiwal (AFS)
- c) Crossbred cattle: Holstein-Friesian × Deshi, Sahiwal × Red Sindhi, Sahiwal × Holstein-Friesian, Holstein-Friesian × Sahiwal, Holstein-Friesian × Deshi, Sahiwal-Sindhi × Jersey, Red Chittagong x Deshi and Deshi x Brahman.

- (Bhuiyan, 2014)

**Notes:**

1. Almost all of the crossbred cattle have been developed for more milk production, but only crossbred has been developed for more meat production, i.e., Deshi x Brahman.
2. Some local cattle have better production potentials than the Nondescript local cattle (Deshi) breed, such as Red Chittagong, Munshigonj cattle etc.
3. Deshi cattle are widely reared all over Bangladesh, while a considerable number of crossbred breeds are reared for milk production.

However, the cattle breeds of Bangladesh could be reared under extensive, semi-intensive or intensive system of rearing either for milk or for meat production, which are as follows:

Extensive, semi-intensive or intensive systems

1. Local breeds

a) For milk production: *Female of-*

Red Chittagong, Pabna, Munshigonj,  
North Bengal Grey and Madaripur breeds.

b) For meat production: *Male of-*

Red Chittagong, Pabna, Munshigonj,  
North Bengal Grey, Madaripur breeds and  
Nondescript local cattle (Deshi).

2. Exotic breeds

a) For milk production: *Female of-*

Jersey, Holstein-Friesian, Sahiwal, Australian Friesian Sahiwal.

b) For meat production: *Male of-*

Holstein-Friesian, Sahiwal, Australian Friesian Sahiwal.

3. Crossbred breeds

a) For milk production: *Female of-*

Holstein-Friesian × Deshi, Sahiwal × Red Sindhi,  
Sahiwal × Holstein-Friesian, Holstein-Friesian × Sahiwal,  
Holstein-Friesian × Deshi, Sahiwal-Sindhi × Jersey,  
Red Chittagong × Deshi.

b) For meat production: *Male of-*

Holstein-Friesian × Deshi, Sahiwal × Red Sindhi,  
Sahiwal × Holstein-Friesian, Holstein-Friesian × Sahiwal,  
Holstein-Friesian × Deshi, Sahiwal-Sindhi × Deshi,  
Red Chittagong × Deshi

- *Male and female of-*

Deshi × Brahman.

**Notes:**

1. Local cattle breeds with better performance, such as Red Chittagong, Pabna, North Bengal Grey, Madaripur and Munshigonj cattle are now rarely available in Bangladesh.
2. The only crossbred breed for meat production, Deshi x Brahman, is still rarely available, but the breed is disseminating throughout Bangladesh.
3. Due to the practices of cross breeding of cattle and rearing of the crossbred cattle over a long period of time in Bangladesh, the crossbred breeds of cattle are, by this time, well adapted to the climatic conditions of Bangladesh.
4. But, the exotic breeds of cattle, except the Sahiwal breed, should also be reared only for milk production under solely the intensive system of rearing in Bangladesh.
5. The female of the Sahiwal breed for milk production and the male of that for meat production could also be selected for rearing in Bangladesh.

Therefore, the following crossbred and exotic pure breed cattle should be selected for the particular purposes (milk or meat production), as mentioned below under the extensive, semi-intensive or intensive systems:

1. Crossbred breeds:

a) For milk production: *Female of-*

Holstein-Friesian × Deshi, Sahiwal × Red Sindhi,  
Sahiwal × Holstein-Friesian, Holstein-Friesian × Sahiwal,  
Holstein-Friesian × Deshi, Sahiwal-Sindhi × Jersey,  
Red Chittagong x Deshi.

b) For meat production: Male of-

Holstein-Friesian × Deshi, Sahiwal × Red Sindhi,  
Sahiwal × Holstein-Friesian, Holstein-Friesian × Sahiwal,  
Holstein-Friesian × Deshi, Sahiwal-Sindhi × Deshi,  
Red Chittagong x Deshi.

- *Male and female of-* Deshi x Brahman.

2. Exotic breeds:

a) For milk production: Female of- Jersey, Holstein-Friesian,

Australian Friesian Sahiwal breeds, Sahiwal breed.

b) For meat production: Male of- Sahiwal breed.

#### **4.1.2.1.2. Selection of Cattle for Rearing**

- a) After selection of a breed of cattle for milk or meat production, it is necessary to select individual cattle for the particular purpose according to its performance traits.
- b) For dairy cattle, physical and reproductive traits and performance of milk production, and for beef cattle, physical and performance traits must be judged.
- c) The owner/ farm manager should check the following selection criteria of the dairy and beef cattle prior to procurement of the dairy and beef cattle for rearing.

### **A. Dairy Cattle (Cow and Replacement Heifer)**

#### **A.1. Physical Characteristics**

1. Simply, cows having voluminous dewlap and large naval flap, well developed udder and teats and prominent milk vein are docile and good milk yielders (Manoj *et al.*, 2008).
2. According to Stamschror *et al.*, 2000, the physical characteristics of an individual dairy cattle can be judged with scoring rates as follows (All traits are listed in priority order) and dairy cattle should score at least 70% for selection.

##### a) Frame: 15%

1. Rump is long and wide throughout with pin bones slightly lower than hip bones.
2. The tailhead is set slightly above and neatly between pin bones, the tail is free from coarseness, and the vulva is nearly vertical.
3. Stature height at the withers and hips should be relatively proportionate.
4. Front end is wide apart and squarely placed, shoulder blades and elbows need to be firmly set against the chest wall and the crops should have adequate fullness.
5. Back is straight and strong and the loin is broad, strong, and nearly level.
6. Head should be feminine, clean-cut, slightly dished with a broad muzzle, large open nostrils, and a strong jaw is desirable.

##### b) Body Capacity: 10%

1. Long, deep and wide barrel. Rib depth and spring toward the rear with a deep flank.
2. Chest is deep and wide floor with well-sprung fore ribs blending into the shoulders.

c) Feet and Legs:15%

1. Feet and rear legs are evaluated. Evidence of mobility is given major consideration.
2. Feet- steep (vertical) angle and deep heel with short, well-rounded closed toes.
3. Rear Legs:
  - a) Rear View- straight, wide apart with feet squarely placed.
  - b) Side View- a moderate set (angle) to the hock.
  - c) Hocks- cleanly molded, free from coarseness and puffiness with flexibility.
  - d) Pasterns- short and strong with some flexibility.

d) Dairy Character: 20%

1. Ribs are wide apart, rib bones are wide, flat, deep, and slanted toward the rear.
2. Thighs are lean/slim, incurving to flat, and wide apart from the rear.
3. Withers is sharp with the chine prominent.
4. Neck is long, lean/slim, and blends smoothly into the shoulders.
5. A clean-cut throat, dewlap, and brisket.
6. Skin- thin, loose, and pliable.

e) Udder: 40%

1. Udder depth- moderate depth, adequate capacity and clearance relative to the hock.
2. Teat Placement- squarely placed under each quarter, perpendicular and properly spaced from side and rear views.
3. Rear Udder- wide and high, firmly attached with uniform width from top to bottom and slightly rounded to udder floor.
4. Fore Udder- firmly attached with moderate length and ample capacity.
5. Udder Cleft- strong suspensory ligament indicated by adequately defined halving.
6. Teats- cylindrical shape and uniform size with medium length and diameter.
7. Udder Balance and Texture- udder floor is level as viewed from the side.
8. Quarters should be evenly balanced, soft, pliable and well collapsed after milking.

### **A.2. Reproductive Characteristics**

The reproductive characteristics of a dairy cow and that of a dairy replacement heifer should be considered and they should-

1. be at puberty at the age of 24 months for indigenous and 12-15 months for crossbred.
2. be first bred indigenous heifers at 30 months and crossbred at 18-20 months of age.
3. have weight at 150-250kg (local) and at 180-275kg (crossbred) for first breeding.
4. have services per conception between 1.6 and 1.8.
5. have conception rates of 60 to 70%.
6. have a gestation period of  $280 \pm 10$  days for each gestation.
7. have open days not more than 85 days after the previous calving.
8. have an inter-calving interval of 360 to 380 days, i.e., one calf per year.
9. be free from reproductive and metabolic diseases, and vices.
10. not have history of dystocia, retained placenta, mastitis, milk fever, ketosis incidence.

### **A.3. Milk Production Characteristics**

The milk production performances of a dairy cow should be considered and she should-

1. be freshly calved (1st to 2nd week after calving) cow at its 1st to 2nd lactations.
2. have dairy physical characteristics that have been described earlier.
3. be free from all types of physical and congenital defects and abnormalities.
4. be free from diseases including infectious and metabolic diseases and infestation.
5. be free from the history of mastitis, milk fever, ketosis, retained placenta, uterine infections, dystocia etc., and all types of vices including kicking at milking.
6. be assessed the milk production potential of the cow, by emptying the udder and milking and weighing the milk with a 12 hours interval (e.g., emptied at 6.00 PM and then milked at 6.00 AM of the next day) for at least 1-2 days to have an average daily milk production of that cow.
7. have a daily milk yield of average 15-20 liters for profitable operation for individual rearing and more than 20 liters for commercial operation.
8. have a lactation length of about 305 days.
9. produce a total milk of around 4,000 liters per lactation.
10. have a milk letdown habit immediately before milking.
11. have excellent feed conversion rate (FCR).

**Note:** The selected dairy cattle must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

## **B. Beef Cattle (Bull Calf, Bull and Bullock)**

### ***B.1. Physical Characteristics***

Simply,

1. The good conformation with thickly fleshed and well-rounded contours.
2. From the rear, it stands wide with convex hindquarters that are wider than their back.
3. From the front, wide between legs and thick through the shoulder with a trim brisket.

However, according to Magazines, 2017, and Daniel Jr. and Kriese-Anderson, 2017, a detailed physical characteristics of an individual beef cattle are mentioned below, and the animal owner/farm manager should check before sourcing cattle for beef purpose rearing.

#### a) Body Structure

1. The neck is moderately long (an indicator of growth).
2. The rump is deep and wide when viewed from the rear with the widest portion about midway between the tail-head and hock.
3. The loin and rump are long, wide and level, meaning the body top is long and strong.
4. The shoulders are well muscled.
5. Have moderately slim in the rear flank, underline and brisket.
6. Chest floor and ribs spring & wide (indicating body capacity & overall productiveness).
7. The ideal beef animal should be nearly level from hooks to pins.
8. Frame or skeletal size is large that is related to the slaughter weight.

#### b) Feet and Legs

1. The legs are strong and stout and squarely set under the four corners of its body.
2. The shoulders are not too straight; this is an indicator of leg problems.
3. The animal should move freely and easily, but not with signs of post-legged, knock-kneed, splay-footed, sickle-hocked or buck-kneed, or with short or straight pasterns.
4. Hooves are free of crack and abnormality with symmetrical claws pointing forward.
5. The ideal slope of the pastern is between 45° and 47°.
6. The angle of the hock is correct and the hind legs are structurally sound if the rear foot is placed in the tracks left by the front foot when the animal is moving forward.
7. Ideally, the pastern, hock, and stifle joints will align in an angle from 140° to 145°.
8. The ideal angle for the scapula/shoulder is about 45° in relation to the ground.

c) Muscle and Skin

1. In bull, thick, heavy and long muscling is desirable with thickness, long and bulge of muscling in the back, loin and round.
2. In females, muscling should be long, smooth and moderately thick.
3. Skin- thin, loose, and pliable.

**B.2. Performance Characteristics**

A beef cattle should-

1. be docile and easily controllable.
2. be a good eater of feed
3. have a high growth rate with excellent FCR
4. be free from diseases and the history any disease incidence

**Note:**

The selected beef cattle must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

**4.1.2.2. Buffalo**

**4.1.2.2.1. Selection of Buffalo Breeds for Rearing**

- a) In Bangladesh, the buffalo population is about 1.51 million (DLS, 2022) of which about 40% in the coastal regions (Faruque *et al.*, 1990).
- b) In addition, there are few buffalo pockets in Bangladesh including coastal area, Sylhet haor area, sugar cane belt of Jamalpur and Kanihari buffalo pocket in Mymensingh district of Bangladesh that are solely used for milk production (Sohel and Amin, 2015).
- c) The river type buffaloes are basically reared for the milk production (Dhanda, 2013).

However, Bangladesh have following breeds of buffalo and that are reared under extensive and semi-intensive systems mainly for milk product and draught purpose.

1. Indigenous: Nondescript Deshi
2. Exotic breeds: Nili-Ravi and Murrah (River Type) and Surti (Swamp Type)
3. Crossbred breeds: River type × Swamp type

- (Bhuiyan, 2014)

Although all types of buffalo breeds could be selected for rearing in Bangladesh, the animal owner/farm manager should select the milk type buffalo breed for milk production (e.g., Nili-Ravi and Murrah, river type buffalo breeds), and draught type for draught purpose (e.g., Surti, Swamp type buffalo breeds).

#### **4.1.2.2.2. Selection of Buffalo for Rearing**

A buffalo cow and a heifer buffalo should-

- a) be freshly calved (1st to 2nd week after calving) buffalo cow at 1st to 2nd lactations that may express longest productive lives and improve milk production over the forthcoming lactations.
- b) have dairy characteristics that include thin skinned, wedge shaped body with appropriate BCS etc.
- c) be free from all types of physical and congenital abnormalities and from all prevailing diseases including infectious and metabolic diseases and infestations.
- d) be free from the history of mastitis, milk fever, ketosis, uterine infections, dystocia etc.
- e) be free from all types of vices including kicking at milking.
- f) be assessed the milk production potential of the buffalo cow, by emptying the udder and milked and weighing the milk with a 12 hours interval (preferably, emptied at 6.00 PM and then milked at 6.00 AM in the next day) for at least 1-2 days to have a precise value of per day milk production of that buffalo cow.
- g) have a daily milk yield of average 10-12 liters for profitable operation.
- h) have a record of lactation length between 300 and 310 days.
- i) have a record of total milk production around 3,000 liters per lactation.
- j) have a milk letdown habit immediately before milking.
- k) have excellent FCR.

#### **Note:**

The selected buffalo cows and heifer buffaloes must be vaccinated against the common diseases prevailing in Bangladesh as per standard vaccination schedule.

### 4.1.2.3. Goat

#### 4.1.2.3.1. Selection of Goat Breeds for Rearing

Bangladesh have following goat breeds:

- a) Indigenous breeds: Black Bengal, Jamnapari
- b) Exotic breed: Beetal, Boer
- c) Crossbred breed: Black Bengal × Jamnapari

- (Bhuiyan, 2014)

#### Notes:

1. Among the goat population, 90% goats are the Black Bengal goat and the remaining 10% are the Jamnapari and their crosses, and the Black Bengal goat is more prolific with shorter kidding intervals and gestation period compared to the Jamnapari.
2. The Black Bengal goat gives birth twice a year and more commonly thrice in 2 years (Zeshmarani *et al.*, 2007) and twinning is more frequent (56.32%) with the average litter size of 2.13, while the Jamnapari has 1.59 average litter size (Hassan *et al.*, 2007).
3. The body weight of the Jamnapari (doe: 30.64 kg) are more than that of the Black Bengal goats (doe: 14.65 kg; Miah *et al.*, 2016).
4. The Black Bengal goat produces lower milk (avg. 0.210 kg/day; Dhara *et al.*, 2012) than the Jamnapari goat, which produce (avg. 0.561 kg/day; (Zailan and Yaakub, 2018).
5. The Beetal goat is heat tolerant and cope with temperatures of 2 - 42°C and can adapt to any climate (Cooper, 2021).
6. The Beetal goat has an average weight: males 65 kg, females 45 kg and bucks 57–100 kg, giving kids yearly averaging 1.66 kids per litter and producing 2.5-4.0 L milk/day for 150–170 days averaging 1.8 L daily with 5% butterfat (Cooper, 2021).

Therefore, all of the 3 breeds could be selected for rearing under the extensive and semi-intensive, even for intensive systems of rearing in Bangladesh, where the Black Bengal and the Jamnapari breeds of goat for meat production and the Beetal goats for both milk and meat production, although their crosses could be also reared.

#### **4.1.2.3.2. Selection of Goat for Rearing**

##### **A. Selection of Does and Doeling for Rearing**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of does and doeling for rearing.

- a) be soft and shiny skinned that indicates sound health.
- b) have broader back, rib cage and rump regions that indicate better feed intake capacity and better breeding characters.
- c) be two dental ages of goat that will be better to procure for breeding.
- d) possess a long preferably low set body, roomy hind quarter, well-formed pliable udder, active foraging habit and good mothering instinct.
- e) have a wide roomy hind quarter with good space between inner aspects of two thighs gives an indication about future development of udder.
- f) have the ability to yield 2 or 3 kids per parturition.
- g) have the maternal character of protecting her kid and with better milk feeding abilities.
- h) be with well grown and blended udder.

##### **Note:**

The selected does and doeling must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

##### **B. Selection of Wether (Castrated Buck) for Rearing**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of wether for rearing.

A wether for rearing should-

1. have good body condition, masculine, be able to move freely having stronger legs and free from defects.
2. have broader back, rib cage and rump regions that indicate better feed intake capacity.
3. be soft and shiny skinned that indicates sound health.
4. be free of disease and parasitic infestations and if any, should be managed properly.

##### **Notes:**

The selected wether must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

#### 4.1.2.4. Sheep

##### 2.4.2.4.1. Selection of Sheep Breeds for Rearing

About 3.75 million sheep are distributed throughout Bangladesh (DLS, 2022) and a few are crossbreeds, but most of the sheep are indigenous (Bhuiyan, 2014). However, the sheep breeds in Bangladesh are as follows and they are fit for rearing under the extensive and semi intensive system of rearing.

- a) Indigenous breeds of sheep: Nondescript Deshi and Garole (Bhuiyan, 2014)

#### **Notes:**

1. The average mature live weight of rams and ewes were 17.90 and 15.07 kg respectively in the Nondescript Deshi (Islam *et al.*, 2018), while the average body weight of adult male is 15.00 kg and adult female 13.7 kg in the Garole sheep (Arora *at el.*, 2005).
2. The litter size of the Nondescript Deshi sheep is 1.99 (Islam *et al.*, 2018), whereas that of the Garole sheep 1.86 (Banerjee, 2008).
3. Each Garole sheep yields about 400g wool/year (Pan and Sahoo, 2003; Pan *et al.*, 2004) and each Nondescript Deshi sheep yields about 853.9g/year (Hassan & Talukdar, 2011).
4. However, the finding shows that the Nondescript Deshi sheep breed of Bangladesh have better productive and reproductive performances than the Garole sheep.

Therefore, the Nondescript Deshi breed sheep of Bangladesh should be selected for rearing under the extensive and semi-intensive system, although the Garole breed sheep are smaller in size than the Nondescript Deshi sheep of Bangladesh could also be selected for rearing under the extensive and semi-intensive system in Bangladesh.

##### 4.1.2.4.2. Selection of Sheep for Rearing

#### **A. Selection of Ewes/Ewe Lambs for Rearing**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of ewes and ewe lambs for rearing. However, the selection criteria of ewes and ewe lambs for rearing are same as described under the section 'A. Selection of does/doeling for rearing' under '4.1.2.3.2. Selection of goats for rearing'.

**Notes:** The selected ewes and ewe lambs must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

## **B. Selection of Wether (Castrated Ram) for Rearing**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of wether for rearing. However, the selection criteria of wether for rearing are the same as described under the section 'B. Selection of Wether (castrated buck) for rearing' of '4.1.2.3.2. Selection of goats for rearing'.

**Notes:** The selected wether must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

### **4.1.2.5. Pig**

#### **4.1.2.5.1. Selection of Pig Breeds for Rearing**

- a) The majority of the Bangladeshi population are Muslim (89.1%), while the second largest religious group being Hinduism (10.0%) and the remaining 0.9% of the population identifies with some other religion (including Buddhism and Christianity).
- b) As the pig is strictly prohibited in Islam, the Muslims do not raise pig, consume pork and even do not touch the pig.
- c) So, a very few people of 10.9% (10.0 + 0.9%) population in Bangladesh are rearing pigs to fulfill their protein demand.

However, only the Indigenous Nondescript breed of pig is found in Bangladesh. Hence, those who are rearing or interested in rearing pigs, must select this only breed for rearing under the extensive system of rearing.

#### **4.1.2.5.2. Selection of Pig for Rearing**

##### **A. Selection Criteria of Pig (Sow, Gilt, Boar and Barrow) for Rearing**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of pigs (sows, gilts, boar & barrow- a neutered boar) for rearing.

A pig should-

- a) have good body conformation with sound health.
- b) have a large-framed body.
- c) have adequate length and depth of the body.
- d) have a minimum of 12 evenly spaced functional teats in sows and gilts.

- e) have thick well- muscled hams and that should be firm and trim.
- f) have back fat thickness of 4 cm or less in gilt and for boars and barrows 3.2 cm or less.
- g) have narrower loin than its shoulder and ham regions.
- h) have strong, sound and straight legs and feet with large and even-sized claws.
- i) walk straight and well, and stand up on its claws without falling over the pastern joints.
- j) have faster growth and eaten more feed than average with good FCR.

**Notes:** The selected pigs must be vaccinated against the common infectious diseases prevailing in Bangladesh as per standard vaccination schedule.

## **4.2. Sourcing of Animals**

### **4.2.1. Poultry**

- a) Poultry (Chickens and Ducks) and/or their day-old baby like day old chick (DOC), day old duckling (DOD) could be obtained locally or from outside Bangladesh by importing them for the poultry farms.
- b) Poultry and/or their day-old baby that are obtained, whatever locally or by importing, should only be from sources with known good health status, certified by a Registered Veterinarian/competent authority/accredited by the competent authority.
- c) Sourcing of poultry and/or their day-old baby from outside Bangladesh by importing mandatorily follow the conditions and subject to-
  - 1) comply with the breeding policy in 'National Livestock Development Policy, 2007,
  - 2) written permission from the competent veterinary authority of Bangladesh,
  - 3) obtain veterinary health certificate from the competent veterinary authority of the exporting country describing the health conditions, disease incidence history of the breed and their parents, disease prevalence in the exporting country, etc.
  - 4) obtain proper documentation on the name and origin of the breed, breed history, purpose of the breed, productivity of the breed etc. from the competent authority of the exporting country.
  - 5) documentation on transport permission of the birds etc.
  - 6) process of import must follow the WOA (World Organization for Animal Health) Terrestrial Animal Health Code: Section 5: Trade Measures, Import/Export Procedures and Veterinary Certification.

- d) If any establishment imports birds and/or day-old birds, the records of pertinent documents should be kept and the documents should be submitted to the competent authority as per requirement of the import of birds and/or day-old birds.
- e) The documents of the local sourcing of birds and/or day-old birds are also important to preserve for traceability.
- f) Although import of fertile eggs still not usually practiced, if any establishment want to import fertile eggs of the desired birds, it should follow all the import procedures as mentioned above in the case of bird and/or day-old bird import.

#### **4.2.2. Livestock**

- a) Livestock could be obtained, either locally or by importing from outside Bangladesh.
- b) Livestock that are obtained, whatever locally or by importing, should be only from sources with known good health status, certified by a Registered Veterinarian or the competent authority or accredited by competent authority.
- c) Sourcing of livestock from other countries by importing mandatorily follow the conditions as mentioned in the section '4.2.1. Poultry'.
- d) If the establishment imports animals, the records of pertinent documents should be kept and the documents should be submitted to the competent authority as per requirement of the import of animals.
- e) The documents of the local sourcing of animals should be preserved for traceability.
- f) The newly procured animals should be submitted into quarantine, if the farm has previous stock of animals.
- g) The newly procured animals should be managed properly to harvest best production.
- h) The animals should be under continuous surveillance of animal owner/farm manager.

## **CHAPTER V**

### **REGISTRATION OF LIVESTOCK AND POULTRY FARMS**

#### **5.1. Registration of Livestock and Poultry Farms**

- a) The DLS provides registration of established and to be established livestock and poultry farms following the respective provisions of the Animal Disease Act, 2005 and the Animal Disease Rules, 2008.
- b) Initially the farm owner must have some commercial documents like trade license, income tax certificates, environmental clearances etc. or as demanded by the registration authority.
- c) The farm owner has to apply to the respective officer of the DLS (Appendix 7) for registration of his/her livestock/poultry farm in an application format, where the farm owner has to furnish the farm related information as per format prescribed in the Animal Disease Rules, 2008 (Appendix 4, 5 or 6) providing all necessary documents.
- d) After submission of the application, the DLS authority shall proceed to the registration procedures having detail physical investigation of the farm for judging the compliance with the terms and conditions that are mandatory for registration of the respective farm mentioned in the Animal Disease Rules, 2008 (Appendix 1, 2 or 3).
- e) If all the information provided in the application are found correct and compliant with the terms and conditions for registration of the respective farm mentioned in the Animal Disease Rules, 2008 (Appendix 1, 2 or 3), the DLS authority will provide the registration of the farm.
- f) The DLS authority will finish the registration procedure by offering a 'Registration Certificate' to the applicant with a registration number of the farm in a prescribed format that mentioned in the Animal Disease Rules, 2008 (Appendix 8) and the farm will be entered into the farm database of the DLS.
- g) The farms will be registered for 5 years from the date of registration and the registration must be renewed minimum 3 months before from the date of expire of the registration (Rule 19 of the Animal Disease Rules, 2008).
- h) If any farmer fails to renew the registration of his/her farm 3 months before the expire date of the registration, he/she shall apply to the Director General (DG) of the DLS for time extension of the registration renewal mentioning satisfactory reason(s) (Rule 19 of the Animal Disease Rules, 2008).
- i) The DG, DLS could extend the registration renewal time for maximum of 3 months with penalty (Rule 19 of the Animal Disease Rules, 2008).

**5.1.1. Registration of Grand-Grand/Grand Parent (GGP/GP) Stock Poultry Farm**

- a) The registration of the GGP/GP stock poultry farm shall be obtained in compliance with the respective terms and conditions for registration of the GGP/GP stock poultry farm that mentioned in the Animal Disease Rules, 2008 (Appendix 1).
- b) The GGP/GP stock poultry farm owner shall apply to the DG, DLS (Appendix 7) for registration of his/her farm in a format that prescribed in the Animal Disease Rules, 2008 (Appendix 4) providing all necessary documents.
- c) After submission of the application, the DLS authority shall have detail physical investigation of the farm for judging the compliance with the terms and conditions for registration of the GGP/GP stock poultry farm mentioned in the Animal Disease Rules, 2008 (Appendix 1).
- d) If the GGP/GP stock poultry farm is found compliant with the terms and conditions of the respective farm for registration that mentioned in the Animal Disease Rules, 2008 (Appendix 1), the DLS authority will provide the registration of the farm offering a 'Registration Certificate' in a prescribed format (Appendix 8).

**5.1.2. Registration of Parent Stock (PS)/Commercial Poultry (CP) Farm**

- a) The registration of the PS/CP farm shall be obtained in compliance with the respective terms and conditions for registration of the PS/CP farm mentioned in the Animal Disease Rules, 2008 (Appendix 2 for PS, and Appendix 3 for CP).
- b) The PS/CP farm owner shall apply to the respective District Livestock Officer (DLO) of the DLS (Appendix 7) for registration of his/her farm in a format prescribed in the Animal Disease Rules, 2008 (Appendix 5) providing all necessary documents.
- c) After submission of the application, the DLO shall undergo a detail physical investigation of the farm for judging the compliance with the respective terms and conditions required for registration of the PS/CP stock farm that mentioned in the Animal Disease Rules, 2008 (Appendix 2 for PS and Appendix 3 for CP).
- d) If the PS/CP stock farm is found compliant with the respective terms and conditions for registration of the respective farm mentioned in the Animal Disease Rules, 2008 (Appendix 2 for PS and Appendix 3 for CP), the respective DLO will provide registration of the farm offering a 'Registration Certificate' in a prescribed format (Appendix 8).

**5.1.3. Registration of Commercial Ruminant's Farm Including Cattle/Buffalo/Goat/Sheep**

- a) Registration of the commercial ruminant's farm shall be obtained in compliance with the respective terms & conditions for registration of the commercial ruminant's farm.
- b) The commercial ruminant's farm owner shall apply to the respective DLO of the DLS (Appendix 7) for registration of his/her farm in a format prescribed in the Animal Disease Rules, 2008 (Appendix 6) providing all necessary documents.
- c) After submission of the application, the respective DLO shall undergo detail physical investigation of the farm for judging the compliance with the terms and conditions required for registration of the commercial ruminant's farm.
- d) If the commercial ruminant's farm is found compliant with the respective terms and conditions for registration of the respective farm, the respective DLO will provide registration of the farm issuing a 'Registration Certificate' in a prescribed format (Appendix 8).

**Notes:**

1. The DLS should have provision to provide preliminary permission for establishing a new livestock/poultry farm to the proposed farm owner before starting the primary activity to launch a livestock/poultry farm.
2. Preliminary permission for establishing a new livestock/poultry farm should require some prerequisite terms and conditions, like species of the proposed farm (livestock or poultry), purpose of the farm, farm type (intensive, semi-intensive or extensive), size of the farm (total stock of animal), location of the farm, area of the farm land, sourcing of animals, availability of skill manpower for the farm, availability of animal feed, availability of veterinary services etc. or others wanted by the permitting authority.
3. The proposed farm owner should seek permission to the DLS authority using a prescribed application format (to be prescribed by DLS), where all the required fields should correctly be filled/mentioned/answered by the owner of the proposed farm.
4. After receiving the application and if the DLS authority become satisfied on the information provided in the application by the applicant, the DLS authority should provide preliminary permission issuing a letter of permission for establishing the new livestock/poultry farm within a stipulated period of time fixed by the DLS authority.

5. The DLS authority may place some terms and conditions in the permission letter like the farm establishment process must be with the knowledge, supervision and monitoring of the local DLS authority (like ULO, DLO etc.), positive report of the local DLS authority on successful completion of the farm establishment process fulfilling the DLS conditions, which will help the farm further to get registration from the DLS etc.
6. A copy of the permission letter should be sent to the local DLS offices with instruction for visiting, supervising and monitoring the establishment process of the farm, and reporting accordingly.
7. When the has been established, the farm owner can apply for registration to the DLS authority, and the application must be through the respective local DLS authority.
8. The respective local DLS authority should verify all the terms and conditions that have been imposed for the preliminary permission as well as that for getting the registration.
9. If the farm is found compliant with all the terms and conditions, the local DLS authority should recommend the farm registration application to the respective registration authority of the DLS.
10. The DLS should have provision like that no farm will get registration unless the farm receives the preliminary permission from the DLS prior to starting a farm, and unless the positive report from the local DLS authority on successful completion of the farm establishment fulfilling the DLS conditions.
11. This preliminary permission process will allow to involve local DLS authority to provide sound technical assistance to correct farm establishment process, animal sourcing etc.
12. This process will also allow the local DLS office to contribute to establish a farm rightly, to have practical knowledge about the farm, to maintain a correct farm data base etc.

## **CHAPTER VI**

### **GENERAL FARM MANAGEMENT**

#### **6.1. Characteristics of A Modern Animal Farm**

A modern animal (livestock and poultry) farm should-

1. have ideal location and design,
2. have necessary modern infrastructures,
3. have all modern production components and facilities,
4. have stock of high productive animal resources,
5. producing high quality products, and value-added and new products,
6. adapting latest technologies including available digital systems,
7. have modern and new machineries and equipment,
8. have good farm base material and purposeful farm investments,
9. using investment on the farm properly,
10. have modern animal identification and traceability,
11. practicing good animal health management protocols,
12. implementing precise, well-defined and good management practices,
13. have trained, creative, energetic and disciplined human resources,
14. have narrow and deep specialization,
15. have innovative, knowledge seeking and continual learning skill professionals,
16. applying a range of innovations,
17. be interested in research and development,
18. have animal breeding system with modern facilities,
19. adapting assisted reproductive technologies (ARTs),
20. growing new varieties of animals,
21. producing quality genetic resources, e.g., semen, sire, embryo, fertile eggs etc. (in terms of high productivity, quality product, healthiness, disease resistance, adaptability and climate resilience, ease of management, good FCR etc.),
22. be independent, operative and quick decisions making,
23. have processing and marketing systems, and be oriented to different markets and niches,
24. be big and have high production volumes,

25. be high economic competitiveness and profitability,
26. be socially responsible and environment friendly,
27. maintaining jobs and creates new jobs,
28. have at least 3 to 5-year development vision,
29. take part in exhibitions and events etc., and
30. become as 'Precession Livestock Farming (PLF).'

## **6.2. Animal Identification and Traceability**

- a) Animal identification and traceability are tools for addressing animal health and food safety issues (WOAH, 2022).
- b) First of all, they help producers and the institutions supporting them to manage their animals more effectively, implementing herd/flock health programs, or applying breeding or genetic improvement programs (WOAH, 2008).
- c) These tools may significantly improve the effectiveness of activities such as: the management of disease outbreaks and food safety incidents, vaccination programs, herd/flock husbandry, zoning/compartmentalization, surveillance, early response and notification systems, animal movement controls, inspection, certification, fair practices in trade, and utilization of veterinary drugs, feed and pesticides at farm (WOAH, 2022).
- d) The records of animal identification and animal traceability should be kept properly, if possible, electronically for inspection by the competent authority and traceability.
- e) If the veterinary authority of Bangladesh feels required, the animal identification and traceability records could be reported and recorded in the respective local DLS office.

### **6.2.1. Benefits of Animal Identification and Traceability**

- a) The reasons for identifying and tracking animals and their products have evolved and include rapid response to animal health and/or food safety concerns, as well as verification of recognized premium commercial production processes as specified on qualifying product labels.
- b) Animal identification and traceability can provide following benefits to the producers as well as to the country-
  - 1) Enhances animal health surveillance and disease eradication.

- 2) Minimizes economic impact of an animal disease outbreak.
- 3) Increases domestic marketing opportunities.
- 4) Provides a valuable management tool for producers.
- 5) Addresses food safety and national security concerns.
- 6) Enhances foreign marketing opportunities for animal and animal products.
- 7) Enhances animal welfare in response to natural disasters.

### **6.2.2. Animal Identification (ID)**

- a) More elaborate animal ID systems include information on the sex, breed, names of all feeds and pharmaceuticals used in raising the animal, and the movement of specific animal products from the processing plant to the retail consumer.
- b) Animal identification and traceability activities are related to disease prevention and control, animal production, food safety, certification of exports etc., and should be under the responsibility of the veterinary authority of a country (WOAH, 2022).
- c) Animal identification process should be done following humane procedures that comply with the provision(s) of the Animal Welfare Act, 2019 of Bangladesh and the rules and regulations passed by the competent authority under this Act.
- d) Animal identification refers to keeping records on individual farm animals or groups of farm animals so that they can be easily tracked from their birth through the marketing chain (CRS, 2010).
- e) Identification of livestock should be done with individual animal and that in the case of poultry should be with batch or flock wise of the respective birds or with individual birds, if necessary.

#### **6.2.2.1. Methods of Animal Identification**

##### **6.2.2.1.1. Livestock**

There are various existing methods of animal identification that has their own advantages and disadvantages.

#### **A. Conventional Methods**

- 1) Conventional methods are not suitable for all animals and can be replicate
- 2) Common conventional methods are-

- a) Ear tagging- Ear tags get smeared when animal approaches to mud that makes this unsuccessful and they are also lost frequently.
  - b) Ear notching/Ear Clipping - Ear notching leads to the development of ear wounds.
  - c) Branding- Branding develops permanent marks on the skin and is very painful to the animals leading to cruelty against animals and also against animal welfare, and branding also decreases hide value for the tanning industry due to severe damage to the skin.
  - d) Tattooing- Tattooing method need close observations for identification and cannot read without catching head of the animal.
- 3) Other than the conventional methods mentioned above for animal identification, there are also some other conventional methods for animal identification such as:  
1) Ruminal Bolus (RFID), 2) Dewlap Tag, 3) Pastern (Leg) Band, 4) Neck Chain, and 5) Color Marking.

## **B. Biometric Methods**

- 1) Biometrics are non-invasive methods for identification of animals.
- 2) An animal biometric identifier is any measurable, robust and distinctive physical, anatomical or molecular trait that can be used to uniquely identify or verify the claimed identity of an animal.
- 3) Common biometric methods are:
  - a) Muzzle prints-
    - (1) This method has been used for identification of animals on the basis of the arrangement and distribution of ridges and valleys on the muzzle.
    - (2) The prints of muzzle are taken from the individual animals are examined for the various muzzle characteristics and recorded for future reference.
    - (3) Muzzle prints were found to be a quicker method than retinal scanning,
  - b) Retinal imaging-
    - (1) Retinal imaging can be used for identification of animals as the blood vessels pattern on the retina is similar to that of fingerprint that pattern fixes at birth and does not change throughout the animal's lifetime.
    - (2) Retinal image is converted into unique identification using computer algorithm.
    - (3) Retinal scans are easy to analyze by inexperienced operators.

### **C. Electronic Methods**

a) The electronic methods are as:

1) Bar Coding-

- (a) Barcodes are symbols that can be scanned electronically using laser or camera-based systems.
- (b) They carry information about the object to which it is attached in a machine-readable format. As opposed to manual data entry, which is tedious and prone to inaccuracies, barcodes enable automatic data capture with 100% accuracy.

2) Radio Frequency Identification Device (RFID)-

- (a) RFID is most common and latest technology which is used for the identification of livestock.
- (b) RFID is a method of recording a unique number that has been assigned to an electronic identification device carried by an animal and is quick, easy and accurate and is more efficient in time management and saves labor cost.
- (c) This provides each animal in the herd/flock with its own individual identification number and can be used as a means of tracking animals on property through sale yards, feedlots and abattoirs to provide traceability.
- (d) RFID devices can be carried externally on the animal such as an ear tag or internally with an RFID bolus.
- (e) It may be used on-farm to collect and store individual animal data that can be easily viewed, analyzed, manipulated and sorted.
- (f) The scanning antennas can be permanently affixed to a surface like a door frame to receive data from persons/animals/objects passing through it and detects the activation signal from the antenna, and transmit the information on its chip, although there are also handheld antennas available.
- (g) RFID tags are of two types: Active RFID tags and Passive RFID tags.
- (h) Active RFID tags have their own power source and the readers can get the signal from a distance however, life span of this device is less than 10 years.
- (i) Passive RFID tags do not require batteries and are smaller in size and have a virtually unlimited life span.

### **6.2.2.1.2. Poultry**

- a) Flock-wise or group-wise identification is used for large number of poultry using numerical number, alphabet or symbol, but some conventional methods are used for identification of individual birds.
- b) Other than the conventional methods, modern electronic methods can be used in individual poultry such as Biothermal FID chip and RFID bird tags.

## **A. Conventional Methods**

### **1) Wing Bands**

- (a) Wing bands are metal clips, preferably aluminum placed in the wing of poultry.
- (b) Wing bands are a permanent identification with a high retention rate that will stay with the chick for life and grow with it.
- (c) Wing bands will not bother the bird and may be covered with feathers when they are older making it more difficult to read.
- (d) Wing bands are usually put on chicks, anywhere from a day old to a few weeks, but can also be put on adult birds.
- (e) Many types of wing bands are commercially available like Zip Wing Band, Jiffy Wing Band, and other Wing Band Styles (Tab End Style, Zip Style, Atlas Seal Style, Self-Piercing Style etc.)

### **2) Leg Bands**

- (a) Leg bands are aluminum or plastic band that wrap around a bird's leg and must be fitted to their leg size.
- (b) Leg bands can be a temporary source of identification or a permanent one.
- (c) Plastic leg bands will fall off easier than metal ones due to the bird pecking at it or excess exposure to weather.
- (d) Leg bands are the best option for those who do not wish to pierce the skin with a wing band or toe punch.
- (e) Leg bands are more commonly used on fully grown birds, but when used on a young bird, the band must be constantly changed as the bird's leg grows.
- (f) Leg bands are typically used in the poultry industry to keep track of individual birds.

### 3) Blinders/Peepers

- (a) Blinders, also known as peepers, are devices fitted to/through the beaks of poultry to block their forward vision and assist in the control of feather pecking, cannibalism and sometimes egg-eating.
- (b) Generally, plastic blinders are used and treated as the modern chicken glass version.
- (c) Using blinders of different colors, the producers track different ages or flocks of birds.
- (d) Some people will only use blinders/peepers on birds that cause problems, while others will use them on their whole flock as a preventive measure.
- (e) Blinders are held in position with a circlip arrangement or carts into the nares of the bird, or a pin which pierces through the nasal septum.
- (f) They can be made of metal (aluminum), neoprene or plastic, and are often brightly colored making it easy to identify birds which have lost the device.
- (g) Some versions have a hole in the center of each of the blinders, thereby allowing restricted forward vision.

### 4) Toe Punches

- (a) Toe punches can be used to mark the webbing between the toes of baby chicks.
- (b) This option works for those who don't need colors or numbers to achieve ID goals.
- (c) Toe punches create a small 2mm hole in the webbing, and there is a total of 16 different markings possible (one hole, two holes etc. in the left and/or right foot).
- (d) Toe punches can be used to a pre-punch hole in the wing webbing for wing bands.

### 5) Other conventional Poultry Identification Options

- (a) **Neck Tags** – Plastic tags that can be hung by the neck of a baby chick.
- (b) **Wing Badges** – Large plastic device with large visible numbers that attaches to wings.
- (c) **Bird Bits** – Plated steel or plastic bits that are placed in the bird's nostrils to help stop pecking and in that case, special deep feeders are needed so that the birds can continue to eat.

## B. Electronic Methods

- 1) Biothermal RFID chip-
  - (a) Biothermal RFID chip can be used for early warning, e.g., for avian influenza.
  - (b) Biothermal chips are approximately 10 mm long and are inserted in the bird's breast with a single inoculation.
- 2) RFID bird tags-
  - (a) RFID can be used for the management of poultry and birds of all types for tracking and scientific testing applications.

### 6.2.3. Traceability

- b) The term 'Traceability' is formed by 'Trace' and 'Ability,' although the definition of traceability slightly varies depending on the industry types.
- c) Traceability is generally defined as the ability to follow the movement of a product through its specified stages of production, processing and distribution, and is a vital system for Quality Management (QM).
- d) Traceability has two distinct components: tracing and tracking.
- e) Tracing creates a history of animal/product navigation throughout the entire supply chain, while tracking is the ability to pinpoint the destination of a particular animal/product from the point of origin to the final point of sale/consumption.
- a) By implementing a well-designed traceability system, industry can prevent disaster and access other multiple benefits, such as-
  - 1) Quality control- traceability offers high-level control over the production process, which encourages quality control that proved invaluable for a production industry.
  - 2) Operational efficiency- full traceability system enable industries optimize their production processes to boost efficiency and reduce resource wastage.
  - 3) Determining root causes and minimizing production costs - traceability allows an industry/business to perform a root cause analysis, which is an in-depth review to determine the source of a problem, which allow the management to solve them as soon as possible, thus, the cost of production is considerably reduced.
  - 4) Maintaining accountability- when there is an issue with an animal or an animal product, it's important to address it as quickly as possible, which can help to save money or prevent the loss of customers that helps the industry to maintain its accountability and integrity.

- 5) Customer satisfaction- with robust traceability systems, industries have greater control over the production process and are better equipped for improvements, which help to present quality products that generously meet customer needs.
  - 6) Meeting compliance- some countries/regions (e.g., USA, UK, EU etc.) require traceability in certain industries, such as food production like animal sourced food.
  - 7) Fighting against copying- traceability is able to guarantee the authenticity of a product or animal and the visibility offered by traceability (e.g., RFID) protects the end user as well as the brand, making it more difficult for fakes to be produced.
- b) Traceability systems can be manual or computer based, where the small industries producing limited numbers of animals/products and have fewer customers paper-based, manual systems may be adequate, but the large industries should use more reliable and efficient computerized systems.
  - c) Traceability systems rely on recording information accurately, and the employees play a major role in ensuring traceability, so training employees is essential to increase awareness, understanding and competence in animal traceability.
  - d) Traceability can be improved following-
    - 1) Keeping proper records
    - 2) Working with both suppliers and retailers/sellers
    - 3) Using real-time communications (include software that allows multiple people to view and edit documents and quickly send messages to one another)
    - 4) Using automated processes (automated traceability processes are automation software that will save time and can work correctly)
    - 5) Finding for the right software
    - 6) Conducting mock recalls

#### **6.2.3.1. Animal Traceability**

- e) Animal traceability is the ability to follow one animal or a group of animals from one point in the supply chain to another.
- f) Animal traceability system is the way where data is recorded and used to track an animal one step forward and back along the supply chain.
- g) Information for animal traceability system should be collected and recorded that include: animal/flock identification number, source of animal with brand name, age, sex, breed, adaptability to climatic condition of an area, productivity and performance level, animal product quality, disease, vaccination and treatment history of animals etc.

- h) At a minimum, information is collected and stored concerning the animal's place and date of birth, name and address of the owner, date and location of movements between the animal's origin, and its place, date and location of slaughter.
- i) If the farm/establishment imports animals and/or breeding materials, records of pertinent documents should be kept properly and the animal owner/farm manager should record all movement of animals in and out of the farm that includes records of veterinary protocols as prescribed by the authority that will be helpful for traceability.
- j) The pillars of an animal traceability system are founded upon the identification of individual animals/homogenous groups of animals, the ability to track their movements, proper identification of premises, and recording information correctly (WOAH, 2008).
- k) Animal traceability system comprised of 3 pillars: (1) Location/premise identification, (2) Animal identification and (3) Animal movement.
  - 1) Location/premise identification- this program is established to plan for control and prevent the spread of animal diseases, and it is also used as an early warning system to notify animal owners of a natural disaster such as a flood, cyclone etc. that could affect their animals.
  - 2) Animal identification- animals are identified either individually or as a group depending on the species. Animal identification is done to track when and where animals have been transported.
  - 3) Animal Movement- is the act of tracing livestock and poultry backwards or forwards through the production supply chain based on animal movement records.
- l) The aim of an animal traceability system is to link the physical flow of animals with the flow of information and to ensure complete documentation of all stages of the supply chain and production.
- m) The purposes of animal traceability are:
  - 1) determination of origin and ownership, and prevention from misrepresentation and theft of animals and animal products,
  - 2) surveillance, control and eradication of animal diseases,
  - 3) biosecurity protection of the national livestock population,
  - 4) increases international link,
  - 5) improvement of management, distribution, delivery systems and inventory controls of the supply chain,

- 6) facilitating value-based marketing,
  - 7) isolation of the source and extent of quality-control and food-safety problems, and
  - 8) improvement of collaboration, transparency, security, and visibility in supply chain.
- n) Animal traceability allows for a fast response in the event of animal disease diagnosis, and successful animal traceability tracks animal illnesses identifying the exact number of animals must be investigated for the disease and reduces the reaction time to the disease outbreak along with the cost to producers and the government.
- o) Advantages of animal traceability allow-
- 1) Animal health protection,
  - 2) Animal disease control,
  - 3) Protection of human safety/Public health safety,
  - 4) Fraud control,
  - 5) Facilitating to maintain withdrawal,
  - 6) Developing food contaminants monitoring programs, and
  - 7) Risk assessment from exposure to animal sourced food.

## **6.3. Feed and Nutrition Management**

### **6.3.1. Poultry**

- a) The animal owner/farm manager should provide the poultry with adequate, safe and clean feed that would allow them to meet their optimum nutrition and expected performance according to the species, breed, strain, age, sex and body weight, as mentioned in the respective appendices of the Appendix Section.
- b) Birds should have adequate and continuous access to clean and safe drinking water.
- c) The water to be used to the farm poultry-
  - 1) should be potable, and non-potable water must be treated to comply with the standards (Appendix 23 and 24).
  - 2) temperature should be between 10°C-15°C for the most comfortable consumption by mature birds, temperatures over 30°C will reduce consumption, and birds will refuse to drink if water temperatures are over 44°C (UK, 2022).
  - 3) water treatment systems shall be checked daily and the parameters are recorded and the record sheet shall be retained with batch records.
  - 4) should have known and acceptable biological and mineralogical quality for drinking water (Appendix 24).

- 5) should be checked regularly for pathogen levels (*E. coli* and fecal coliforms as indicators of efficacy of sanitation).
- 6) sanitizing system, if any, is checked at least once for every batch of birds.
- d) The animal owner/farm manager should provide a daily feeding schedule or routine (e.g., Appendix 22).
- e) The animal owner/farm manager should supply feed to the birds as per the routine.
- f) Farm owners/managers should acquire feed from the suppliers who follow recognized good manufacturing practices and/or good hygiene practices that meet the standards and quality set by the country regulations or government directives.
- g) Where on-farm feed manufacturing is practiced, procedures should be designed to minimize contamination and to prevent the inclusion of undesirable feed components, e.g., aflatoxin B1, rye ergot (*Claviceps purpurea*), free gossypol, hydrocyanic acid, theobromine, volatile mustard oil etc.
- h) Farm managers should only use ingredients from authorized and traceable suppliers and expert assistance should be taken where necessary.
- i) The equipment that are using for feed mixing should be kept clean at all times and have a regular preventive maintenance schedule both for machinery and contamination.
- j) Feed supply/distribution chains (transport, storage and feeding) should be managed to protect feed from pollution with biological, chemical and physical hazards, and to minimize deterioration.
- k) Feeds should be stored in a designated area under good ventilation and management.
- l) Farm should record and keep documents for ensuring quality and traceability including, but is not limited to the following:
  - (1) type of the feed, ingredients and supplements;
  - (2) supplier/source of the feed, ingredients and supplements, and their registration;
  - (3) individual quantity of the feed, ingredients and supplements;
  - (4) declaration of the ingredients of the feed and supplements;
  - (5) document of laboratory analysis for the feed, ingredients and supplements;
  - (6) document of quality control laboratory tests for the feed, ingredients and supplements that should include the analysis for quality of the feed, ingredients and supplements and the presence of deleterious substances to them;
  - (7) date of manufacturing and/or packing with batch number, date of expiry (if applicable), which is applicable in case of package feed and
  - (8) date of delivery.

- m) Farm should have a list of approved and banned veterinary products and chemicals that are regulated by the competent authority and make available for inspection.
- n) Feeds should not contain banned ingredients, chemicals and veterinary drugs, including those are disallowed by the competent authority.
- o) Standard biosecurity management should be followed every time for feed receiving, processing of feed (if any), storing of feed and feeding management.

### **6.3.2. Livestock**

- a) Livestock should be provided with optimum level of nutrition at all times, as required for their physiological functions and well-being as per species, breed, age, sex & weight.
- b) Livestock should have adequate & continuous access to clean and safe drinking water.
- c) Safe, nutritious and clean adequate rations/feeding materials (silage, grasses, legumes and concentrates) that are suited for cattle, buffaloes, goats, sheep and pigs should be provided as per the species, breed, age, sex and body weight.
- d) The farm should keep a record of available forage (silage, grasses and hay) and grains, especially in the smallholders' and large-scale livestock farms.
- e) When giving commercial feed, farm owners/managers should use those that have been officially registered with the competent authority.
- f) In cases of farm-mixed feed formulation, farm owners/managers should use ingredients from authorized and traceable suppliers.
- g) The feed mixing/preparing equipment should be kept clean at all times and have a regular preventive maintenance schedule both for machinery and contamination.
- h) Banned chemicals, feed additives, supplements and any form of medication in the diet of the animals including those disallowed by the competent authority are not used.
- i) The animal owner/farm manager should provide a daily feeding schedule or routine.
- j) The animal owner/farm manager should supply feed to the livestock as per the routine.
- k) Procurement documents of feed, ingredients and supplements should be kept and updated properly and that should include, but is not limited to the following:
  - (1) type of the feed, ingredients and supplements;
  - (2) supplier/source of the feed, ingredients and supplements, and their registration;
  - (3) individual quantity of the feed, ingredients and supplements;
  - (4) declaration of the ingredients of the feed and supplements;
  - (5) document of laboratory analysis for the feed, ingredients and supplements;

- (6) document of quality control laboratory tests for feed, ingredients and supplements include their analysis for quality and presence of deleterious substances to them;
  - (7) date of manufacturing and/or packing with batch number, date of expiry (if applicable), which is applicable in case of package feed and
  - (8) date of delivery.
- l) Standard biosecurity management should be followed every time for feed receiving, feed processing (if any), feed storing and feeding management.

## **6.4. Animal Health Management**

### **6.4.1. General Guidelines**

- a) The animal owner/farm manager should be responsible for maintaining good health of the animals at all times through proper management including treatment, prevention and control of diseases, and containment of the disease affecting the animals.
- b) Animal health care should be supervised by a Registered Veterinarian on the farm and other animal rearing facilities.
- c) The health status of the animals on the farm/rearing facilities should regularly be monitored and recorded by the owner/manager of farm/rearing facility.
- d) The effectiveness of animal health programs for livestock and poultry on a farm or rearing facility should be monitored and recorded regularly.
- e) The farm/rearing facility should have written vaccination and deworming schedule (like Appendix 30, 31, 32, 33, 34 and 35).
- f) Veterinary assessment of the establishment/farm should be carried out annually by a Registered Veterinarian and/or by the competent authority.
- g) Up-to-date records of the operations and management routines of the farm/rearing facility should be properly kept and maintained for easy retrieval and traceability.

### **6.4.2. Introduction of New Stock**

- a) Newly arrived animals including day-old birds should be kept separate from resident stock for a particular period for quarantine to prevent possible disease spread.
- b) Each animal purchased/obtained by born in the farm/facility in case of livestock should have identification with ear tag or other approved means and in case of poultry, each batch of birds purchased/hatched in the own hatchery should have batch identification number and history of acquired of animals for traceability.

### **6.4.3. Surveillance and Control of Diseases**

- a) There should be a written animal health program in place as per species, breed, age and sex including the vaccination and deworming programs (like Appendix 30, 31, 32, 33, 34 and 35) that are updated regularly and be supervised by a Registered Veterinarian in accordance with the requirements of the competent authorities and/or compliance.
- b) Vaccination program (like Appendix 30, 31, 32 & 33) should be adopted against diseases as per species, breed, age and sex of animals as approved by the competent authority.
- c) The diseased animals should be separated from the healthy animals (i.e., isolation) so as not to transmit the infection to the healthy animals and the diseased animals should be humanely culled where necessary according to the provisions of the Animal Disease Act, 2005; Animal Disease Rules, 2008 and Animal Welfare Act, 2019.
- d) Designated area/pen for “suspected diseased animals” should be provided in a safe distance from the resident stock for quarantine.
- e) All treated animals and/or their products (eggs, milk & meat) should not be allowed for human consumption/ marketed for human consumption until drug withdrawal period is completed and certified fit for human consumption by a Registered Veterinarian.
- f) There must be a national control program for anthrax, brucellosis and tuberculosis in case of livestock farms and rearing facilities.
- g) Adequate measures should be implemented in order to prevent udder infections in dairy cattle and other milk producing animals.
- h) The farm/facility should have adequate programs for preventing metabolic and nutritional deficiency diseases and disorders in poultry and livestock.
- i) The farm/facility should have sufficient measures for preventing incidence of the periparturient diseases, disease conditions, difficulties and abnormalities in livestock.

### **6.4.4. Protocols When Disease Is Suspected**

- a) If there is an outbreak or suspicion of epidemic disease, the farm should follow the requirements of the laws and regulations on animal epidemic disease control of the country (Animal Disease Act, 2005 and Animal Disease Rules, 2008) and WOA (World Organization for Animal Health) codes and guidelines.
- b) Emergency strictly biosecurity measures should be taken to the farm/rearing facility.
- c) The owner/manager of the farm/facility should report immediately or within 24 hours to the relevant authority regarding any incidence of abnormal behavioral changes, health conditions and mortality or any characteristic of a livestock (e.g., anthrax, PPR, classical swine fever etc.) or poultry [e.g., highly pathogenic avian influenza (HPAI), Newcastle disease (ND), duck plague etc.] disease outbreak.

#### **6.4.5. Laboratory Testing**

- a) Routine testing should be carried out in the qualified laboratory for surveillance and/or monitoring of notifiable diseases.
- b) In case of a reportable disease outbreak, testing should be conducted in approved /accredited laboratory and should continue until the disease has been controlled.

#### **6.4.6. Drugs, Medicine and Biologics (Vaccines etc.)**

- a) Drugs, medicines and vaccines should only be used for treatment and prophylactic reasons, and be kept in a safe place to prevent their quality deterioration and contamination to the environment.
- b) The use of illegal and ban medicine and vaccines must be prohibited and only those approved by the competent authority of Bangladesh should be used.
- c) Medicines and biologics used should be registered with the competent authority.
- d) The use of drugs, medicines, vaccines, and medicated feeds for disease control should be in accordance with the instructions of a Registered Veterinarian as per regulations.

#### **6.4.7. Prevention and Treatment**

- a) The use of the medicines and biologics should be under the supervision of a Registered Veterinarian or the competent authority.
- b) Drugs/medicines should be dispensed as recommended by a Registered Veterinarian.
- c) Drugs, medicines, and vaccines should be administered by a Registered Veterinarian or by personnel trained with veterinary medication and vaccination under the supervision of a Registered Veterinarian.
- d) Drugs, medicines, vaccines and other biologics should be stored separate from other items in appropriate places and identified properly.
- e) Proper disposal of empty vials and unused drugs, medicines, vaccines & other biologics should be followed to prevent contamination to the environment.
- f) Controlled drugs must be strictly used under supervision of a Registered Veterinarian.

#### 6.4.8. Record Keeping of Animal Health Management

- a) The animal owner/farm manager should keep & maintain complete records of animal health programs (like disease monitoring, medication, vaccination, and prevention and control measures etc.), and all records should be easily retrievable for traceability.
- b) Records of animal health programs (like disease monitoring, medication, vaccination and prevention and control measures etc.) include, but are not limited to, the following:
- |                                    |                                       |
|------------------------------------|---------------------------------------|
| 1) Vaccination program;            | 7) Post-mortem findings;              |
| 2) Deworming program;              | 8) Surveillance;                      |
| 3) Disease condition;              | 9) Disposal;                          |
| 4) Diagnosis;                      | 10) Mortality and                     |
| 5) Intervention or treatment done; | 11) Fumigation (for feeds and litter) |
| 6) Control measures;               |                                       |
- c) The farm should maintain updated records of medicine purchase and administration that should be readily available for inspection.
- d) The procurement records (medicine and biologics) should have:
- |  |                      |
|--|----------------------|
| 1) Name of the product (generic compound); | 4) Batch number;     |
| 2) Date of purchase/collection;            | 5) Expiry date and   |
| 3) Quantity purchased;                     | 6) Name of supplier. |
- e) Administration records of drugs should consist of the following:
- |                                      |   |
|--------------------------------------|---|
| 1) Type of drugs or medication used; | 7) Identification of birds/livestock/group treated; |
| 2) Batch number;                     | 8) Number of birds/livestock treated;               |
| 3) Date of administration;           | 9) Date of completion of treatment;                 |
| 4) Reason for administration;        | 10) Withdrawal period and                           |
| 5) Route of administration;          | 11) Name of person who administered the drugs.      |
| 6) Quantity of medicine used;        |   |

## **6.5. Bio-Security Measures**

- a) Bio-security procedures should be well implemented to prevent disease occurrence into farm/rearing facility/hatchery (facility) and/or to control its spread within facility.
- b) The facilities should have a written protocol of biosecurity measures with proper public warning signs that displayed in the respective visible places.
- c) For poultry that are in pens/houses/buildings, the cages should be netted to prevent entry of migratory birds and predators.
- d) In the cases of free-range poultry, control measures that include putting them in cages while there is outbreak of highly contagious diseases (e.g., HPAI, ND, duck plague etc.) to prevent them from commingling with free ranging domestic birds, wild and migratory species.
- e) All-in all-out system should be applied to birds and animals reared for meat production, if possible, this system could be applied to vehicles, personnel and equipment, and thus this prevents the entry and exit of infectious agents to and from the farm respectively.
- f) For livestock that are in an intensive and semi-intensive system of rearing, the farm/rearing facility should be surrounded by fencing or boundary wall to prevent other non-farm animals like wild, pet and stray animals, and predators.
- g) For livestock in an extensive system of rearing, the animals should be closed in a confined area while there are cases of contagious disease outbreak like (e.g., FMD, anthrax, PPR, CSF etc.) to prevent them from commingling with other livestock.
- h) Vaccines are a pillar of biosecurity in the farms/rearing facilities that prevent the viral and bacterial diseases which can cause high mortality and morbidity.
- i) External and internal parasites should be controlled that prevents the entry of infectious agents through vectors and also the parasitism in poultry and livestock.
- j) Stray animals should never be allowed within the premises and the authority of the establishment should have adequate measures to prevent the entry of stray animals.
- k) Access to the establishment should be limited to visitors and only the essential visitors should be allowed and a visitor log book should be maintained.
- l) The implementation of bio-security measures should be continuously monitored/ audited to assess the effectiveness of the program.

- m) The farm/rearing facility/hatchery should have the appropriate and functional lay-out and infrastructure to ensure effective implementation of the bio-security measures, and the facilities should include:
  - 1) For changing (changing dress, shoes etc.), washing and shower (shower, hand washing facilities etc.) for visitors and staffs; and
  - 2) For disinfection (with appropriate disinfection and concentration), disinfection facility at the entry and exit point of the farm (e.g. wheel bath or spraying) and the building (footbath).
- n) The biosecurity measures should take into attention the relevant diseases identified by the local regulations/authority.
- o) All incoming animals/birds should undergo the appropriate quarantine measures and the imported animals/birds and their products should be accompanied by official documentation from the competent authority of the exporting country.
- p) The premises should always be kept clean with good drainage system to prevent disease occurrence, establishment of breeding ground for pests and to avoid environmental degradation.
- q) Appropriate hygiene and sanitation programs should be implemented properly that allows both the personal and farm hygiene to facilitate the prevention of diseases transmission and to keep the farm/rearing facility/hatchery clean, and pathogen and contamination free, which in turn prevents the diseases occurrence in animals.
- r) Appropriate working uniform and footwear should be provided to workers and visitors who need to be at the operation and processing areas.
- s) Environment friendly, safe and effective integrated pest (fly, rodent, etc.) control measures should be executed in the farm and the other animal rearing facilities.
- t) However, the following specific measures should be implemented in poultry hatcheries:
  - 1) one-way product and work flow should be maintained from egg receipt to day old bird dispatch.
  - 2) Differentiation should be maintained between clean and dirty areas of hatchery.
  - 3) Inside traffic should always flow from “clean” areas to “dirty” areas and never from “dirty” areas to “clean” areas.

- 4) Incoming air to the hatchery should be filtered and the room air pressure of the hatchery should be regulated e.g. egg rooms and incubator rooms should be positive, day old bird processing room should be negative.
- 5) There should be dedicated vehicles to transport hatching eggs from breeder farm to hatchery and be cleaned and disinfected inside and outside before and after use.
- 6) All new and used equipment should be thoroughly cleaned and disinfected before entering the hatchery.
- 7) Incubation hatcher and setter equipment should be in good working order, sealed and easy to clean.
- 8) Mobile equipment brought onto the site from other hatcheries or units must be washed, disinfected, and dried before entering the hatchery.
- 9) Staff should not keep or have contact with other poultry or any avian species.
- 10) The establishment should have a designated area for smoking, eating and drinking.

## **6.6. Hygiene and Sanitation Management**

### **6.6.1. Hygiene Management**

#### **6.6.1.1. Personal Hygiene**

- a) Workers should wear dedicated protective clothing, if necessary, with masks and separate foot wear at all times that can be sanitized.
- b) Workers' movement in the farm and hatchery should be controlled to avoid cross contamination between different age groups of animals.
- c) Workers should enter clean areas first then move to dirty areas and they should not move from dirty areas to clean areas in the facility where 'clean' and 'dirty' areas have been differentiated e.g., in the poultry hatchery.
- d) Workers should ensure that unnecessary accessories and personal properties that may pose hazards may not be brought in the production area.
- e) Interruption (changing dress, shoes etc., and shower, hand washing etc.) should be done before entering the production area for workers coming from outside the farm.

#### **6.6.1.2. General Farm Hygiene**

- a) Farm/rearing facility/hatchery should have a cleaning and disinfection procedures.
- b) Only approved chemicals should be used for cleaning and disinfection procedures.
- c) Premises of the establishment should be kept neat and clean with good drainage system and free of potential conditions conducive to breeding of pests and disease outbreak.
- d) Organic materials should be regularly removed from all animal contact surfaces (floors, partitions), and where bedding is used, it should be regularly changed and/or topped up.
- e) The farm should have appropriate equipment and tools and arrangements for effective and functional hygiene and sanitation operation.

#### **6.6.2. Sanitation Management**

- a) Farm premises should be kept neat and clean, and free of potential conditions conducive to breeding of pests, animal parasites and disease outbreak to avoid negative impact on the landscape, environment and animal welfare.
- b) Compost stations should be positioned away from the activities of the farm, and the waterways also be protected from rain to avoid leaching.
- c) Toilets and septic tanks should be kept so that potential overflows will be avoided.
- d) Effluent ponds should be located away from farm and should not overflow.
- e) Waste water should be treated before discharging into the environment.
- f) Waste water treatment process should be properly functional and maintained.
- g) The farm should have a proper and functional drainage system.
- h) The farm should have a written sanitation program including IPM (integrated pest management) for control of fly, insects, rodent etc.
- i) The sanitation program for poultry hatchery should follow some specific procedures:
  - 1) Hatchery must be kept cleaned, disinfected and orderly condition after each hatch.
  - 2) The egg room walls, ceilings, floors, door, heater, air filters, humidifiers and drains should be cleaned and disinfected regularly after every hatch.
  - 3) The egg processing building/area should be designed, located and constructed of materials that allow for right egg sanitation events, and easy, effective and routine sanitation of the building itself, and that should be cleaned and disinfected daily.
  - 4) The incubator/hatcher room walls, ceilings, floors, fan grills, vents and ducts should be cleaned and disinfected after each set or transfer.

- 5) The following should be cleaned and disinfected:
  - (a) Processing equipment and rooms after each hatch;
  - (b) Egg trays should be cleaned and disinfected after each transfer.
  - (c) Baby bird boxes before reusing; and
  - (d) Vaccination equipment after use.
- 6) Hatchery waste and by-products, such as baby birds down, eggshells, infertile eggs, and unhatched eggs should be disposed of following procedures that approved by the competent authority.
- 7) Baby birds should be kept separate from the incubation room for a period of time after hatching, and any nutritive material provided to them should be certified and free of avian pathogens.

#### **6.6.2.1. Pest Control Program**

- a) The farm/rearing facility/hatchery should be constructed as pest-proof as possible including protection against rodents, wild birds or insects that are destructive, annoying or injurious to health.
- b) A pest control plan should be maintained that includes frequent monitoring of rodent, bird or insect activity.
- c) Adequate rodent bait and traps should be placed, if there is evidence of rodent activity and the baits should be approved by the competent authority and be used responsibly.
- d) There should be control measures to prevent pets and other animals from accessing the farm/rearing facility/hatchery buildings.
- e) The surrounding areas of the farm/rearing facility/hatchery should be well-maintained, and grass, shrubs and trees should be trimmed regularly, and debris and unused equipment should be removed.
- f) There should be an IPM program, if necessary, pesticides could be used as per manufacturer's instructions.
- j) The IPM should include:
  - (1) Farm premises should have condition to prevent possible vermin infestation.
  - (2) Farm should have IPM to reduce or eliminate pests including rodents and insects.
  - (3) Only approved chemicals and baits should be used in pest control programs.

## **6.7. Waste Disposal and Environment Management**

### **6.7.1. Waste Disposal**

- a) Any farm waste (solid/liquid/gaseous) disposal should always be environment friendly.
- b) Litter, solid (including biohazard waste) and liquid waste should be managed and disposed of according to the relevant guidelines imposed by the competent authority.
- c) The farm manager should maintain and display clear instructions on procedure for disposal of farm solid wastes and chemical wastes (e.g. expired pesticide with their containers, paint with their containers, empty containers etc.) and veterinary wastes (e.g. expired medicines with their containers, empty containers, surgical wastes etc.)
- d) The farm should have a proper handling and disposal system for sick, injured and dead animals, and should be in accordance with existing regulations of the authority.
- e) The farm manager should be familiar with the proper procedure for disposal and schedule of actions to be taken, especially at the time of emergency.

### **6.7.2. Environment Management**

- f) The farm manager should ensure that animal farming activities do not contribute to the environmental degradation (land/water/air) and cause destruction to bio-diversity.
- g) Regular waste removal would discourage ammonia buildup and promote better air quality within buildings and odorless fresh environment.
- h) The farm should regularly monitor the air quality and maintain it at acceptable levels.
- i) The animal excreta are the major solid waste of animal farms that are liberating greenhouse gasses (e.g., methane due to enteric fermentation and nitrous oxide due to soil management activities) that should be minimized.
- j) Combating the animal origin greenhouse gas emission, the farm manager should have an effective procedure like biogas plant that could allow to burn the gasses.
- k) As the slurry from biogas plant may cause another environment issue, but it can be managed by transforming them into fertilizer by drying or composting.
- l) Measures should be in place to keep out noise that could potentially affect growth and productive performance of animal, specifically around poultry brooder houses, milking parlors, maternity and nursing pens.
- m) The farm should take appropriate measures to minimize excessive odor coming from the farm and that may be associated with waste decomposition.

## CHAPTER VII

### BREEDING, BREEDING PRACTICES AND USE OF ART

#### 7.1. Breeding of Animals

- a) Generally, breeding is carried out in animals in order to improve desirable traits of the existing breeds of animals and that is done by two ways:
  - 1) Selection (based on breed type, body conformation and performances) and
  - 2) Crossbreeding [using breeding bull/artificial insemination (AI)/assisted reproductive technologies (ARTs)]
- b) Only sexually mature animals of appropriate age and weight, and free from any disease or probable inherited abnormality should be bred.
- c) In natural mating, appropriate male to female ratio of animals should be practiced.
- d) Only duly trained certified personnel, preferably science graduate should perform assisted reproductive techniques (e.g. AI, estrus synchronization, ovum pickup, semen sexing, embryo transfer etc.) in the animals.
- e) The farm manager should maintain individual animal records including their lactation, breeding and reproductive performance.
- f) Breeding activities must be properly recorded, maintained, monitored and evaluated.

#### 7.1.1. Poultry

As Bangladesh still does not have any independent breeding policy for poultry in place. However, a short breeding policy for poultry has been described in the 'National Livestock Development Policy, 2007'. So, breeding of poultry should be the basis of this policy.

##### 7.1.1.1. Chicken

###### 7.1.1.1.1. Chicken for Egg

Policy: In-country strain development using exotic and Deshi chicken genetic resources.

The exotic egg breeds of chicken in Bangladesh are White Leghorn and Fayoumi, and the Deshi chicken is the Nondescript Deshi. So, breeding of chicken for egg production should be as:

1. White Leghorn x Nondescript Deshi and Nondescript Deshi x White Leghorn
2. Fayoumi x Nondescript Deshi and Nondescript Deshi x Fayoumi

#### **7.1.1.1.2. Chicken for Meat**

Policy: In-country strain development using exotic and Deshi chicken genetic resources (Naked Neck, Aseel, improved Deshi).

The exotic meat breeds are Australorp and White Cornish, and the Deshi meat breeds are Naked Neck, Aseel and improved Deshi breed of chicken. So, breeding of chicken for meat should be as:

1. Australorp x Naked Neck and Naked Neck x Australorp,
2. White Cornish x Naked Neck and Naked Neck x White Cornish,
3. Australorp x Aseel and Aseel x Australorp
4. White Cornish x Aseel and Aseel x White Cornish
5. Australorp x Improved Deshi and Improved Deshi x Australorp
6. White Cornish x Improved Deshi and Improved Deshi x White Cornish

#### **Notes:**

1. To maintain the acceptable performance traits of the crossbred strains of chicken for more egg or more meat production, breeding should be performed between the chickens with the best performance traits of the flock of a particular crossbred breed that has been developed either for more egg or more meat production.
2. Breeding between the same breed of the local chicken should be performed for conservation of the local genetic resources in Bangladesh.
3. Care should be taken so as not to be inbred.

#### **7.1.1.2. Duck**

##### **7.1.1.2.1. Duck for Egg**

Policy: In-country strain development using exotic and Deshi duck genetic resources (Khaki Campbell, Indian Runner, Jinding, Nageswari and Sylhet Mete with Deshi).

The exotic egg breeds of duck in Bangladesh are Khaki Campbell, Indian Runner, Jinding, Nageswari and Sylhet Mete, and the Deshi chicken breed is the Nondescript Deshi. So, breeding of chicken for egg production should be as:

1. Khaki Campbell x Deshi and Deshi x Khaki Campbell
2. Indian Runner x Deshi and Deshi x Indian Runner
3. Jinding x Deshi and Deshi x Jinding
4. Nageswari x Deshi and Deshi x Nageswari
5. Sylhet Mete x Deshi and Deshi x Sylhet Mete

#### **7.1.1.2.2. Duck for Meat**

Policy: In-country strain development using exotic and Deshi duck genetic resources (between Muscovy and Deshi)

So, breeding for meat breed of duck should be as:

1. Muscovy x Deshi and
2. Deshi x Muscovy

#### **Notes:**

1. To maintain the acceptable performance traits of the crossbred breeds of duck for more egg or more meat production, breeding should be performed between the ducks with the best performance traits of the flock of a particular crossbred breed that has been developed either for more egg or more meat production.
2. Breeding between the same breed of the local ducks should be performed for conservation of the local genetic resources in Bangladesh.
3. Care should be taken so as not to be inbred.

### **7.1.2. Livestock**

As Bangladesh still does not have any independent breeding policy for livestock in place. However, a short breeding policy for livestock has been described in the 'National Livestock Development Policy, 2007'. So, breeding of livestock should be the basis of this policy.

#### **7.1.2.1. Cattle**

##### **7.1.2.1.1. Cattle for More Milk**

Policy A: Inseminate the top most crossbred Holstein-Friesian cows (daily yield 10 kg or more) reared under intensive management system with imported semen of progeny tested bulls of Holstein- Friesian cattle having milk yield 9,500 – 10,000 kg in 305 days lactation period (LP).

So, breeding for more milk production under the 'Policy A' should be as:

1. Holstein-Friesian cow (average 10 kg milk/day or more) x Holstein- Friesian bull (average yield of the dam 31.15 - 32.75 kg milk/day or 9,500 - 10,000 kg in 305 days LP).

Policy B-1: Inseminate crossbred Holstein-Friesian cows (yielding 6-10 kg milk/day) reared under semi-intensive management with semen of progeny tested 50% Holstein-Friesian bulls (50% Holstein-Friesian X 50% Local) with milk yield about 4,500kg in 305 days lactation period.

So, breeding for more milk production under the 'Policy B-1' should be as:

1. Holstein-Friesian cow (6-10 kg milk/day) x 50% Holstein-Friesian bull (50% Holstein-Friesian X 50% Local) having milk yield of the dam about 14.75 kg/day or 4,500kg in 305 days lactation period.

Policy B-2: The Sahiwal or Sahiwal crossbred cows should be inseminated with semen of Sahiwal bulls having  $\geq 2,500$ kg milk production potential per lactation.

So, breeding for more milk production under the 'Policy B-2' should be as:

1. 100% Sahiwal cow x 100% Sahiwal bull having average milk yield of the dam at least 8.17 kg/day or 2,500 kg or more per lactation.
2. Sahiwal crossbred cow x 100% Sahiwal bull having average milk yield of the dam at least 8.17 kg/day or 2,500 kg or more per lactation.

Policy C: Inseminate native cows under low input production system with the semen of progeny tested/pedigree bulls of Sahiwal, Pabna, Red Chittagong, Munshiganj cattle or other improved Deshi cattle.

So, breeding for more milk production under the 'Policy C' should be as:

1. Native cow x Sahiwal bull
2. Native cow x Bull of Pabna Cattle
3. Native cow x Bull of Red Chittagong Cattle
4. Native cow x Bull of Munshiganj Cattle
5. Native cow x Bull of North Bengal Grey Cattle
6. Native cow x Bull of Madaripur Cattle

#### **7.1.2.1.2. Cattle for More Meat**

a) Policy A: 'Use dual purpose crossbred males (FriesianxDeshi) in high input production system'.

So, 'Policy A' is a selection process for more meat production.

b) Policy B: 'Use up-graded Brahman x Deshi (50 % - 50 %) germplasm under research trial'.

So, 'Policy B' is not applicable in the production field.

c) Policy C: 'Procure small doses of high merit Brahman semen from beef rich countries.'

So, 'Policy C' is a plan of action for implementation of the Policy B.

d) Policy D: 'Use only improved Deshi males (Red Chittagong, Pabna and typical indigenous) in the subsistence low input production system'.

So, 'Policy D' is a selection process for production of more meat.

#### **7.1.2.2. Buffalo**

##### **7.1.2.2.1. Buffalo for More Milk**

Policy A: Up-gradation of dairy buffaloes reared under intensive system with imported (or locally produced) semen of Murrah, Nili-Ravi or Mediterranean Breeds having milk yield of 3,000kg/LP.

So, breeding for more milk production under the 'Policy A' should be as:

1. Nondescript Deshi buffalo x Murrah buffalo semen (Dam with 3,000 kg milk/LP)
2. Nondescript Deshi buffalo x Nili-Ravi buffalo semen (Dam with 3,000 kg milk/LP)
3. Nondescript Deshi buffalo x Mediterranean buffalo semen (Dam-3,000kg milk/LP)

Policy B: Up-gradation of dairy buffaloes reared under semi-intensive system using 50% Murrah/ Nili-Ravi 50% native buffaloes by Inter se mating.

So, breeding for more milk production under the 'Policy B' should be as:

1. Nondescript Deshi buffalo x 50% Murrah and 50% native buffalo bull semen
2. Nondescript Deshi buffalo x 50% Nili-Ravi and 50% native buffalo bull semen

Policy C: Up-gradation of dairy buffaloes reared under low input production system using 50% Murrah/Nili-Ravi and 50% native buffaloes by Inter se mating.

So, breeding for more milk production under the 'Policy C' should be as:

1. Local available buffalo x 50% Murrah and 50% native buffalo bull semen.
2. Local available buffalo x 50% Nili-Ravi and 50% native buffalo bull semen.

Policy D: Special conservation program should be undertaken for the swamp buffaloes of greater Sylhet and Chittagong districts by founding farms in the respective areas.

So, for conservation of germplasms, breeding among the swamp buffaloes of greater Sylhet and Chittagong districts under the 'Policy D' should be as:

1. Swamp buffalo female of greater Sylhet x Swamp buffalo male of greater Sylhet
2. Swamp buffalo female of greater Chittagong x Swamp buffalo male of greater Chittagong

### **7.1.2.3. Goat**

#### **7.1.2.3.1. Goat for More Meat**

Policy A: Use high merit purebred Black Bengal buck or semen all over the country.

Policy B: Ensure steady production of consistently superior pure Black Bengal buck/semen.

So, the Policy A and B encourage to use only pure Black Bengal buck or semen in the breeding all over Bangladesh, which tends to eliminate all other genes by the genes of Black Bengal breed. However, the conservation of the germplasm, particularly of a potential pure breed of animal is utmost necessary. Hence, the germplasm of a goat breed could be conserved using the gene of the animals of the same breed in the breeding.

For example,

1. Black Bengal x Black Bengal = Black Bengal
2. Jamnapari x Jamnapari = Jamnapari
3. Beetal x Beetal = Beetal

#### 7.1.2.4. Sheep

##### 7.1.2.4.1. Sheep for More Meat

Policy A: Use and fix up crossbred [Lohi/Romney Marsh x Deshi (50% X 50%)] in the sheep pocket areas of the country.

So, breeding for more meat production under the 'Policy A' should be performed in the sheep pocket areas of the country as:

1. Lohi x Deshi = (50% Lohi and 50% Deshi)
2. Romney Marsh x Deshi = (Romney Marsh 50% and Deshi 50%)

Policy B: Ensure steady production superior Lohi/Romney Marsh x Deshi ram or semen.

So, 'Policy B' is a plan of action that is to be taken for breeding and fixing the crossbred breeds. The Policy B is almost similar to the Policy A and the breeding can be performed as per the Policy B as:

1. Lohi ewe/ewe lamb x Deshi ram = (50% Lohi and 50% Deshi)
2. Romney Marsh ewe/ewe lamb x Deshi ram = (Romney Marsh 50% and Deshi 50%)

#### 7.1.2.5. Pig

- a) There is no breeding policy for the pig in Bangladesh.
- b) Breeding must be between the boar and sow/gilt of the Indigenous Nondescript breed.
- c) Care should be taken during breeding so as not to be inbred.

## 7.2. Breeding Practices

### 7.2.1. Breeding Methods

The following one or more breeding methods could be selected according to the aim of the animal owner/farm manager for poultry and livestock breeding-

- a) Random Mating: mating of individual animals without any selection and is used in developing a control population to compare and measure the effects of other breeding methods and also to estimate the effects of the environment and the true genetic gain.
- b) Inbreeding: mating between individual animals that are more closely related to each other than the average relationship between all individuals in a population. There are 3 methods of inbreeding:

- 1) Close inbreeding: mating between sibs and parents and progeny. Full sib mating and back crossing of the progeny to the younger of the parents are often practiced.
  - 2) Strain Formation: developing a small group of animals within a breed and variety with a special character, e.g., Babcock strain of Single Comb White Leghorn developed to lay heavier eggs.
  - 3) Line breeding: it is inbreeding with an ancestral line and is the most intensive form of back-crossing which is backcrossing to the same parent for several generations in succession.
- c) Out-breeding/cross-breeding: mating between individual animals which are less closely related than the average relationship within the population. Mating between strains/inbred lines are the forms of out-breeding/cross-breeding and the methods of out-breeding are as follows:
- 1) Single/2-way cross: two different populations (inbred lines, strains or breeds) are crossed to produce a first filial (F1) generation, which is purely for commercial purpose but not for breeding. F1 here usually exhibits hybrid vigor especially when inbred lines are involved. When two inbred lines of the same breed are crossed, the progeny is said to be in-crossbred, e.g.,  $A \times B = AB$ .
  - 2) Three-way cross: in this method, F1 crossbred females (AB) are mated to males of a third line (C), to obtain a F2 progeny (ABC), e.g.,  $A \times B = AB$ ,  $AB \times C = ABC$ .
  - 3) Four way cross: Two different single crosses (AB and CD) are crossed to obtain ABCD, e.g.,  $A \times B = AB$ ,  $C \times D = CD$ ,  $AB \times CD = ABCD$ . This is usually practiced in poultry breeding for crosses between inbred lines of low viability since only a relatively small number of animals of the lines A, B, C, D need to be maintained.
- d) Crossing to develop a new breed: different breed types have been crossed to produce the modern breeds so as to combine desirable traits from many sources, e.g., Cornish developed from Aseel, Malay and English game breeds.

However, selection of breeding animals prior to breeding is mandatory for successful breeding practices. So, the selection criteria of both the poultry and livestock are described under the respective animal groups (Poultry and Livestock).

## 7.2.2. Poultry

- a) The dam lines are selected for their reproductive performances, e.g., egg production, egg size & weight, shell quality, age at sexual maturity, hatchability and juvenile growth.
- b) The sire lines are primarily selected for improving the growth rate, body conformation, FCR, fertility and carcass quality.
- c) The animal owner/farm manager should select the breeder birds based on following selection criteria mentioned under the respective species of poultry for better breeding performances.

### 7.2.2.1. Chicken

#### 7.2.2.1.1. Selection Criteria of Breeder Chicken (Layer and Broiler)

- a) Age at sexual maturity (male and female): 16-24 weeks.
- b) Feed conversion rate should be efficient.
- c) The breeder chicken should be physically sound and free from skeletal problems/ abnormalities (majorly osteomalacia and osteoporosis) and metabolic disorders.
- d) Temperament of the breeder chicken should be mild and polite.
- e) Livability of the breeder chicken should be longer.
- f) The breeder hens/pullet should-
  - 1) have relatively thin pelvic bones having little fat and gristle coating of  $\leq 1/4$  inch thick.
  - 2) have  $\geq 3$  fingers gape between the pelvic bones forming the pelvic arch.
  - 3) have  $\geq 4$  fingers distance between the pelvic arch and the rear tip of the keel bone.
  - 4) be quicker molter, as the quicker the molt, the quicker the birds get back to laying.
  - 5) have a soft pliable abdomen, which is a good sign of a healthy hen/pullet.
  - 6) have a capacious body with enough space within the body to appropriately house its internal organs as the egg size and body size are positively correlated.
  - 7) begin laying in the late February or early March that tend to be better egg layers.
  - 8) begin to lay early and tend to lay smaller eggs, and come into production between 180 and 215 days of age that tend to develop into excellent layers.
  - 9) lay  $\geq 25$  eggs during August and March in the first year tending to be good producers.
  - 10) be tended to have brittle or broken feathers.
  - 11) have a record of higher rate of egg production as expected.
  - 12) have better and expected egg weight, eggshell strength and egg albumen height.

- 13) have desirable eggshell color.
  - 14) not have any inclusions (blood and meat spots) in the egg.
  - 15) be persistent egg layer and clutch size should be bigger.
- g) The male of the breeder chicken should have-
- 1) strong body conformation, free from defects, and be able to mate hens successfully.
  - 2) acceptable quality and quantity of semen with higher fertility.
  - 3) rapid rate of growth, excellent FCR and carcass quality.

#### **7.2.2.1.2. Selection Criteria of Layer Breeder Chicken**

- a) Age of starting laying eggs: 24 (16-28) weeks.
- b) Weight (local breeds) at the age of breeding: Male- 750-900g; Female- 650-750g.
- c) Weight (exotic breeds) at the age of breeding: Male- 2300- 2500g; Female- 1400-1550g.

#### **7.2.2.1.3. Selection Criteria of Broiler Breeder Chicken**

- a) Age of starting laying eggs: approximately 26 weeks.
- b) Broiler breeder should attain their body weight  $\geq$  1500g (market weight) by 4 weeks.
- c) Body weight at the age of breeding: Males-  $\geq$  2300g; Females  $\geq$  1600g by 16 weeks.
- d) The breeder should have higher breast muscle weight and good quality meat.

#### **7.2.2.1.4. Mating/Breeding of Chicken**

The animal owner/farm manager could select one or more mating methods from the following to use in chicken breeding practices according to their facility and scope-

- a) Pen Mating: males are allowed to mate with a group of females at a male and female ratio of 1:10 for egg type and 1:6 for meat type poultry. Pedigreeing is possible both on sire's (father) as well as on dam's (mother) side in this mating method. This method is widely used in Bangladesh for poultry breeding.
- b) Artificial Insemination: semen is deposited into the female reproductive tract by a pipette. It is used in case when a male of superior qualities cannot mate, too heavy or too old for natural mating, but AI requires more labor, has risk of cross contamination of birds through the inseminating equipment, and may cause stress due to handling.

### **7.2.2.2. Duck**

#### **7.2.2.2.1. Selection Criteria of Breeder Duck (Duck and Drake)**

- a) Age of both the breeder ducks and drakes should be 6 months at breeding.
- b) First-year ducks and drakes are the best for breeding and they should be vigorous.
- c) The rate of feathering should be rapid to cover the body within a short period of time.
- d) The breeder ducks should be a good egg producer.
- e) The breeder drakes should have high fertility.
- f) The breeder ducks should have high hatchability of eggs.
- g) The breeder ducks and drakes should consume less amount of feed.
- h) Both the breeder ducks and drakes should have good, strong and stout body contour, free from any skeletal abnormality, other physical defect, or any disease.
- i) The breeder ducks and drakes should have longer productive life.

#### **7.2.2.2.2. Mating/Breeding of Ducks**

- a) Pen Mating: males are allowed to mate with a group of females in a pen at a male and female ratio of 1:5 for heavy breeds (e.g., Muscovy) and 1:8 for lighter breeds (e.g., Khaki Campbell), although for intensive system the ratio should be 1:6 (drake:duck).
- b) Flock mating/pasture mating: males are allowed to run along with the females in a flock throughout the day and night with the male and female ratio of 1:5 for heavy breeds like Muscovy and 1:8 for lighter breeds, such as the Khaki Campbell.

**Note:** However, mating should be allowed for 2 weeks before eggs are collected for setting.

### **7.2.3. Livestock**

#### **7.2.3.1. Cattle (Cow/Heifer)**

##### **7.2.3.1.1. Selection Criteria of Cows/Replacement Heifers for Breeding**

The animal owner/farm manager should pay attention to the following reproductive parameters of cows/heifers and take necessary action for better breeding performances.

- a) Age at puberty: 24 months for indigenous and 12-15 months for cross breeds.
- b) Age at first breeding: 30 months for indigenous and 18-20 months for cross breed.
- c) Weight at first breeding: 150-250 kg for indigenous and 180-275 kg for cross breeds.
- d) Estrus cycle length: 21±3 days for both the indigenous and cross breeds.
- e) Duration of estrus: 12-18 hours for both the indigenous and cross breeds.

### **7.2.3.1.2. Estrus (Heat) Signs and Estrus Detection in Cows/Heifers**

#### **A. Estrus (Heat) signs**

1. Sign of Early Heat: duration of early heat generally is 3-8 hours or may be 6-10 hours.
  - a) Sniffs other animals and being sniffed by other animals,
  - b) Mounts other animals but walks away when mounted,
  - c) Looks restless around, fuzzing, nervous, curious,
  - d) Bellowing, mowing, stands alone, licking other cows,
  - e) Vulva is slightly swollen,
  - f) Does not stand when mounted,
  - g) Reduced feed intake, sometimes decline in milk production.
2. Signs of Standing Heat: duration generally is 6-18 hours or may be 12-18 hours.
  - a) Sniffs other animals and being sniffed by other animals,
  - b) Especially sniffing vulvas or urine of other cows,
  - c) Mounts other animals and stands when mounted,
  - d) Nervous and restless, mowing, bawls frequently,
  - e) Vulva is swollen and deep red, clear mucus flow and the tail bent away from vulva,
  - f) May stop/refuse to eat and social contacts, and often milk production declines,
  - g) Sharp decline in milk production,
  - h) Behaves otherwise and fight with other cows,
  - i) Turns in circle or presses her chin on the back of other cows,
  - j) Frequently urinate.
3. Signs of after Heat: duration generally is 3-12 hours or may last for 24 hours.
  - a) Bawls, mounting other animals,
  - b) Roughened tail head, streaks of saliva or signs of licking on her flanks,
  - c) Still sniffs other animals and being sniffed, but the intensity is less,
  - d) Refuses to stand to be mounted and runs away when mounted,
  - e) Vulva is slightly swollen, less flow or clear mucus from vulva, some bleeding from the vulva, dried mucus on the tail and shows symptoms of cool down.

### 7.2.3.1.3. Estrus Detection in Cows/Heifers

The animal owner/farm manager could detect heat in cows and heifers by following means:

- a) Visual Observation: Visual observation is a commonly used method of heat detection that involves recognizing and recording the heat signs by a trained observer.
  - 1) Observable signs of heat include-
    - (a) mounting or attempting to mount other cattle,
    - (b) standing to be mounted by other cattle ('standing heat' is the confirm sign)
    - (c) willing to mount others but may not stand to be mounted and this usually indicates she is either coming into or going out of standing heat.
    - (d) smelling and trailing other females,
    - (e) bellowing, nervous and excitable behavior,
    - (f) mud on hindquarters and sides of cattle, roughed up tail hair,
    - (g) vulva swelling and reddening, clear vaginal mucus discharge,
    - (h) mucus smeared on the rump and depressed appetite,
  - 2) Visual observation method requires observation of cattle at least twice daily, typically early in the morning and late in the evening for best results.
  - 3) Nearly 20% more cattle will be observed in heat when checked 4 times a day compared to the checking twice daily.
  - 4) The season of the year can influence heat, more cows showing heat at night in hot weather and more showing heat during the day in cold weather.
  - 5) Hot weather, high production, overcrowding, poor housing conditions and high stress environments may reduce mounting activity.
- b) Use of Teaser Bull: Teaser bulls are bulls, which are surgically altered to prevent successful mating, but have the ability of mounting on the estrus females (cows). The teaser bull should not be excessively large and must be free from diseases.
  - 1) Teaser bulls are allowed to the paddock and pasture with females to mount on the cows/heifers that are in heat and thus the heat is detected and that are very effective in detecting weak and silent heat.
- c) Heat Detection Aids: Heat detection aids are available in the world market, but probably not available in Bangladesh and are be used to detect heat, and can supplement the visual observation, but not replace that. The common heat detection aids are: (a) breeding and mounting indicators, (b) tail markers and (c) electronic mounting monitors.

#### **7.2.3.1.4. Breeding/Insemination of Cows/Heifers**

- a) Natural Service: is the breeding of cows/heifers directly by a breeding bull.
  - 1) Natural service poses a risk of transmission of reproductive and venereal diseases from breeding bull to cows/heifers and vice versa.
  - 2) One cow/heifer can be bred once by one ejaculation of a breeding bull.
- b) Artificial Insemination: is the breeding of cows/heifers by inseminating with a particular amount of liquid or deep-frozen semen of a breeder bull.
  - 1) Semen is collected from a breeder bull, evaluated, extended, divided into several doses and preserved at refrigerator temperature or in ice to be used for 3-5 days as liquid semen, and deep-frozen semen are preserved in liquid nitrogen intended to be used for a long time (for years).
  - 2) There is no risk of disease transmission from sire to dam and vice versa.
  - 3) A number of cows/heifers can be inseminated by one ejaculate from a breeder bull as it is divided into several doses.
  - 4) AI ensures economic use of genetic material and its wide distribution.

#### **7.2.3.2. Buffalo (Buffalo cow/Heifer buffalo)**

##### **7.2.3.2.1. Selection Criteria of Buffalo Cows/Heifer Buffaloes for Breeding**

The animal owner/farm manager should pay attention to the following reproductive parameters of buffalo cows/heifer buffaloes and take necessary action accordingly for better breeding performances.

- a) Age at puberty: 24-30 months for buffalo (heifer buffalo).
- b) Age at first breeding: 30-36 months for heifer buffalo.
- c) Weight at first breeding: 300-350 kg for heifer buffalo.
- d) Estrus cycle length: 21 days for buffalo.
- e) Duration of estrus: 12-18 hours for buffalo and that is the same as in cattle.

##### **7.2.3.2.2. Heat (Estrus) Signs of Buffalo Cows/Heifer Buffaloes**

The main heat signs of buffalo cows and heifer buffaloes are:

- a) Remain restless, raising head in a typical fashion.
- b) Local non-descript buffalo cows and heifer buffaloes bellow, the bellowing is sharp and for longer duration, remain off feed, and milk yield is reduced.

- c) Expose their teeth while bellowing which is very characteristic.
- d) Vulva becomes edematous and swollen and the lower portion of the vulva looks soiled.
- e) Vulvar lips show a gap and slight opening, and vulvar folds are shallow or vanished.
- f) Mucous membrane of vulva becomes reddish, moist and glossy.
- g) Mucus can be seen before or after estrus spontaneously in about half of the cases.
- h) Mucus discharge is thin on the day of heat, becomes thick as the time passes and changes the color from clear to white.
- i) Mucus is scanty and suddenly dropped, and is not usually noticed by the owner.
- j) Color, consistency and fern pattern of mucus help in determination of correct estrus.
- k) Engorged teats in lactating buffalo cows (milk holding for increased blood estrogen).
- l) Frequent urination, the urine coming in spurting action wetting the perineum and drying of the urine leaves white marks on skin.
- m) 60-70 % of buffalo cows come in heat after sunset and before sunrise (6 pm to 6 am).

**Note:**

Buffalo cows and heifer buffaloes neither mount on other buffaloes nor other buffaloes mount on her in heat and in some cases, they do not bellow and show silent heat, especially high yielders.

**7.2.3.2.3. Estrus Detection in Buffalo Cows/Heifer Buffaloes**

- a) Visual Observation: Visual observation is a commonly used method of heat detection that involves recognizing and recording the signs of heat by a trained observer. The observer should watch the buffalo cows/heifer buffaloes twice daily, once in the evening and then in the early morning for identifying heat signs.
- b) Use of Teaser Bull: weak or silent heat can be detected by using teaser bulls in the paddock and pasture of the buffalo farms.
- c) Heat Detection Aids: Heat detection aids are available in the world market, but probably not available in Bangladesh and could be used to supplement but not replace visual observation. The common heat detection aids are: (a) breeding and mounting indicators, (b) tail markers and (c) electronic mounting monitors.

#### **7.2.3.2.4. Breeding of Buffalo Cows/Heifer Buffaloes**

- a) Natural Service: is used in breeding of buffalo cows/heifer buffaloes directly by a breeding bull and maximum of the female buffaloes are bred by this way in Bangladesh.
- b) Artificial Insemination: breeding of cows/heifers by inseminating with a dose of liquid/deep-frozen semen of breeder bull, but AI is still limited for buffaloes in Bangladesh.

#### **7.2.3.3. Breeding Management of Cattle and Buffalo**

The animal owner/farm manager should-

- a) always keep a record when signs of heat are observed in cattle and buffalo.
- b) provide non-slippery footing and ample room to interact freely during estrus, however, rough or sand floor increases mounting and standing activity more than concrete floor.
- c) detect estrus efficiently to improve reproductive performance and profitability of farms.
- d) breed cattle and buffalo preferably with AI, where AI is not available by breeding bull during standing heat (6-18 hours or 12-18 hours after onset of heat).
- e) watch the bred cattle and buffalo carefully every 3 weeks after breeding (3, 6, 9 weeks).
- f) not observe any heat in the bred cattle and buffalo, if she is pregnant.
- g) check the bred cattle and buffalo from 45 to 60 days after breeding for pregnancy by trained personnel or a Registered Veterinarian.
- h) shift the female cattle and buffalo that was found pregnant to the maternity pen of the farm or to a separate safe and comfortable area of the housing.
- i) check the record of the bred cattle and buffalo and call a Registered Veterinarian to examine her, when she is found not pregnant after 60 days of breeding.
- j) call a Registered Veterinarian to examine female cattle and buffalo that are not conceived after 3 services.
- k) prepare a 3-week estrus calendar to see easily when a female cattle or buffalo should come into the next heat and for other reproductive management (a demo 3-week heat calendar has been shown in the Appendix 25).
- l) examine and treat female cattle and buffalo with abnormal vaginal discharge by a Registered Veterinarian.
- m) allow the female cattle and buffalo to give birth in isolation, preferably in a parturition room/pen/area and clean up and sterilize the calving area to make contamination free applying approved disinfectant before and after parturition.

- n) employ the correct technique, if calving requires assistance.
- o) practice a general sanitation program during the periparturient period.
- p) follow a disease prevention program against the diseases affecting reproduction.
- q) supply appropriate nutrition for both the dam and the newborn.
- r) provide suitable shelter and management for both the mother and the newborn.
- s) follow the 'National Guidelines on Good Livestock Production Practices'.
- t) see the 'Important reproductive details/Breeding guidelines for cattle and buffalo' that has been shown in the Appendix 26.

#### **7.2.3.4. Goat (Doe/Doeling) and Sheep (Ewe/Ewe lamb)**

##### **7.2.3.4.1. Selection Criteria of Doe/Doeling and Ewe/Ewe Lambs for Breeding**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of does/doelings and ewes/ewe lambs for breeding.

The does/doelings (female goat) and ewes/ewe lambs (female sheep) should-

- a) be at puberty at the age of 6-8 months.
- b) be bred for the first time at the age of 6-8 months.
- c) have weight of 7-10 kg at the first breeding (females should be mated only when they reach 70% of the average adult body weight).
- d) be bred for 7-12 years of age.
- e) have an average estrous period of 19-21 (range 17-24) days in does/doelings and 16-17 (range 14-19) days in ewes/ewe lambs.
- f) have estrus length about 34-38 hours in female goats and 24-36 hours in female sheep.
- g) be come into heat after 21 days of kidding/lambing.
- h) have the ability to yield 2 or 3 kids in parturition.
- i) be with well grown and blended udder.

##### **7.2.3.4.2. Selection Criteria of Buck/Ram for Breeding**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of buck/ram for breeding.

A sound breeding buck/ram should-

- a) be at least at the age of 8 months and be kept for breeding up to 5 years of age.
- b) have the ability to locate female goats and sheep in heat and successfully breed them.
- c) have adequate senses of sight and smell.
- d) have good body condition, masculine, and stronger legs and free from defects.

- e) be able to move freely and be free of any physical defect, especially defect of legs.
- f) have broader back, rib cage and rump regions that indicate better feed intake capacity and better breeding characters.
- g) be soft and shiny skinned that indicates sound health.
- h) show good libido to achieve desirable breeding.
- i) be free of disease including parasitic infestation, if any should be managed properly.
- j) have scrotal circumference of  $\geq 20$  centimeters at the age of 8 to 10 months depending on the breeds of goat and sheep.
- k) have 2 equal size intact testicles that can move freely within the scrotum and are proportionate in size to the scrotum.
- l) not have sore, swelling, blood clot or adhesion in penis, urethral process and prepuce.
- m) have a good quality semen with milky or creamy appearance including the following-
  - (1) Buck vs. Ram: semen volume (mL): 0.8 (0.5 to 1.0) vs. 1 (0.8 to 1.2),
  - (2) Buck vs. Ram: sperm concentration (billion/ml): 2.4 (2 to 5) vs. 2.5 (1 to 6),
  - (3) Buck vs. Ram: sperm motility (%): 80 (70 to 90) vs. 75 (60 to 80) and
  - (4) Buck vs. Ram: morphological normal sperm (%): 90 (75 to 95) vs. 90 (80 to 95).

#### **7.2.3.4.3. Estrus (Heat) Signs of Goat and Sheep**

The estrous does/doelings and ewes/ewe lambs generally show the following signs-

- a) Redden of the vulva and discharge from vulva
- b) Tail wagging (shaking).
- c) Seeking male and mounting other animals.
- d) Frequent bleating (moaning).
- e) Pushing her back against hard objects.
- f) Standing for mating.

#### **7.2.3.4.4. Male Activities with Estrous Female**

When the males are kept with females in a flock, the males are attracted by smell, sight and sound of the estrous females, and exhibit following behaviors-

- a) Sniff the vulva.
- b) Extending neck with curling of upper lip.
- c) Biting the side of the estrus female and pulling wool.
- d) Paw the female raising and lowering of one front leg in a stiff legged striking motion.
- e) Mount and mate.

#### **7.2.3.4.5. Estrus/Heat Detection in Goat and Sheep**

The animal owner/farm manager could identify the estrous females by-

- a) Observing the estrus signs and male activities: estrous females can be identified by observing the estrus signs and the activities of males in the flock.
- b) Using an intact male: observing the male activities allowing it into the flock to identify and breed the estrous females.
- c) Using intact male fitted with apron: an apron, made of a soft piece of cloth (60x45 cm), is tied on the abdomen of the intact male to cover the penis, and the male is allowed into the flock in the morning and evening for 15 to 20 minutes each time to identify the estrous female and that are separated and bred with the desired buck/ram.
- d) Using teaser buck/ram: allowing teaser buck/ram to detect the females in heat, which are marked and separated out for breeding with desired buck/ram.

#### **7.2.3.4.6. Mating/Breeding of Goat and Sheep**

The animal owner/farm manager could breed the estrous females by-

- a) Hand mating: the females are allowed to mate one by one with a male, but one male is allowed to mate not more than 3 ewes/does in a day.
- b) Pen mating: the females are divided into batches of 15 to 20 ewes/does in each batch and kept in a pen, and the males are allowed into the flock at male and female ratio of 1:20 only during the night time and separated in the morning.
- c) Flock mating/Pasture mating: males are allowed to run along with the females for the whole day and night, although males and females may lose their BCS in this system due to over running.
- d) Artificial insemination: the speculum method of cervical AI is used for does and ewes with fresh or frozen semen that offers the best means of distributing germplasm from nucleus breeding flocks to many small flocks.

#### **7.2.3.4.7. Breeding Management of Does/Doelings and Ewes/Ewe Lambs**

The animal owner/farm manager should-

- a) procure goat/sheep for using in breeding from the best farmer who maintained them in the best manner with good nutrition and health management.
- b) keep breeding records of heat dates, service and parturition of female goat and sheep.

- c) use records in predicting the heat dates and observe the heat signs of the does/doelings and ewes/ewe lambs, and the male activities during estrus for heat detection.
- d) be careful for detecting heat in females in their normal breeding season (September to October, February to March and May to June).
- e) sort does/ewes on BCS 30 days prior to buck/ram introduction and supplement thin does/ewes so they are at least an average BCS at breeding.
- f) deworm all does/ewes 30 days prior to the start of breeding and flush ewes, i.e., feed does/ewes so they are gaining weight prior to the start of the breeding season.
- g) vaccinate does/ewes & doeling/ewe lambs to prevent abortion for Vibriosis & Chlamyda.
- h) shear rams at least 30 days prior to breeding.
- i) use teaser buck/rams before breeding season to stimulate does/ewes.
- j) detect estrus of all females above one year either with aproned or vasectomized male both in the morning or evening during breeding season.
- k) put young males to be experienced older females and older males to younger females that will help in better mating.
- l) avoid inbreeding and that can be done by replacing or exchanging males once in 2 years.
- m) avoid breeding too young females to avoid higher pregnancy loss.
- n) allow one buck to remain together with 2 to 3 does/doelings in heat for a whole day or whole night and is followed for 3 cycles can ensure 90% conception rate in females.
- o) provide 2 services at an interval of 8 to 12 hours that may improve the conception rate.
- p) consider female goat/sheep as pregnant, when they do not show estrus after 2 cycles.
- q) separate the pregnant female goats/sheep from the dry and non-pregnant animals and be kept in a group of not more than 15 to 20 female goats/sheep to avoid infighting.
- r) cull the female goats/sheep from the flock that have no kidding/lambing for one year.
- s) avoid kidding/lambing during peak winter (15 December-15 January) and peak summer season (15 May-15 June) that will save the kids/lambs from cold and heat stress.
- t) avoid starvation of pregnant females for even two days early in pregnancy that can cause a high percentage of embryo loss.
- u) allow the female goat/sheep to give birth in isolation, preferably in a kidding/lambing room/pen/area and clean up and sterilize the parturition area to make it contamination free by applying approved disinfectant before and after the kidding/lambing.
- v) employ the correct technique, if kidding/lambing requires assistance.

- w) practice a general sanitation program during the periparturient period.
- x) supply appropriate nutrition for both the dam and the newborn.
- y) provide suitable shelter and management for both the mother and the newborn.
- z) follow the 'National Guidelines on Good Livestock Production Practices'.

### **7.2.3.5. Pig (Sow/Gilt)**

#### **7.2.3.5.1. Selection Criteria of Sow/Gilt for Breeding**

The animal owner/farm manager should check the following selection criteria prior to collection or procurement of sows/gilts for breeding.

The sows/gilts should-

- a) be at puberty at the age of 7-9 months.
- b) be at least 8 months old and have body weight at 100-120 kg at first service.
- c) have the length of estrus of 2-3 days (1-2 days in gilts and 2-3 days in sows).
- d) have the duration of estrus cycle of 18-24 days (average 21 days)
- e) return to heat 2 to 10 days after weaning of the piglets.
- f) have a gestation period of 114 days.
- g) restore normal uterine physiology by 20-25 days postpartum.
- h) have well-formed vulva and at least 6 pair well-shaped prominent teats starting from well forward and spacing evenly on each side of the belly without having super-numerary and inverted teats, and fat deposited at the base of the teats.
- i) be weaned from a litter with  $\geq 9$ -10 piglets and select gilt from fast-growing weaners.
- j) have first farrowing at one year of age and farrowing interval of 7 months.
- k) have developed ham, good length with light shoulders and head.
- l) have a good body conformation with strong and straight legs, and sound feet with large and even-sized claws.
- m) walk well straight and stand up on claws without falling over pastern joints.

#### **7.2.3.5.2. Selection Criteria of Boar for Breeding**

The owner/manager should select a boar for breeding considering following criteria.

A breeding boar-

- a) must be at least 8 months old.
- b) must be physically sound and free from any defect.

- c) should grow faster than average.
- d) should have less back fat than the average of the breed.
- e) should have eaten less feed than average to reach a specific weight.
- f) should reach 90 kg live weight before it is 140 days old.
- g) should have FCR of 2.99:1 or better to grow from 30 to 90 kg live weight.

#### **7.2.3.5.3. Estrous Signs of Sow/Gilt**

1st stage: Early heat signs

- a) General restlessness,
- b) Vulva turns red and swollen, and white mucus discharge.

2nd stage: Service period signs

- a) Real estrus lasts for 40 - 60 hours,
- b) Vulva becomes less red and swollen, and slimy mucus discharge,
- c) Tendency to mount and be mounted by others,
- d) Stand on back pressure (can accept a man's weight sitting on her),
- e) Vocalizing, slanted ears and kyphosis (curvature of the spine that causes the top of the back to appear more rounded than normal).

3rd stage: Post estrus signs

- a) Not stand when pressure is applied to her back.
- b) Swelling of the vulva disappears.

#### **7.2.3.5.4. Estrus Detection of Sows/Gilts**

The animal owner/farm manager could detect the estrous sows/gilts by-

- a) observing the estrus signs of sow/gilt with once or twice a day.
- b) confirming the standing heat by a positive response to the “back-pressure” test.
- c) using teaser or vasectomized boar (9 months of age or older.)

#### **7.2.3.5.5. Mating/Breeding of Sow/Gilt**

- a) Pen mating: the boar runs with females in a pen only during the night time and separated during day time with male-female ratio of 1:4 for mature boars and 1:2 for young boars.

- b) Hand mating: the females are allowed to mate one by one with a boar and is most commonly used in purebred animals.
  - (1) A mature boar should be used for  $\leq 2$  breeding/day.
  - (2) The female is usually mated 2- or 3-times during estrus, with the first service on the first day of standing estrus, and subsequent mating at 24-hour intervals. The use of two different boars may increase the number of piglets per litter.
- c) Pasture mating/herd mating: boar is allowed to run with females in the herd on the pasture with male-female ratio of 1:20.
- d) Artificial insemination: AI can be performed using either single-sire (semen from one boar) or pooled (semen from 3 to 6 boar) extended semen.
  - (1) The extended semen should be used within 72 hours after collection.
  - (2) If heat detection is performed twice per day, the estrus gilt should be inseminated twice, 8-12 hours after the onset of standing heat and again 12–16 hours later, and the sow should be inseminated 24 hours after onset of standing heat and again 18–24 hours later.
  - (3) If heat detection is performed once per day, gilts should be inseminated within 4 hours and sows within 12–16 hours from when they were first observed in standing heat and again 18–24 hours later.

#### **7.2.3.5.6. Breeding Management of Sows/Gilts**

The animal owner/farm manager should-

- a) keep accurate breeding records of dates of heat, service and farrowing of sows/gilts.
- b) use records in predicting the heat date and observe the sows/gilts for heat detection.
- c) be conscious about the estrus signs of sows/gilts for correct heat detection.
- d) select gilts at weaning period, further selection should be done 5-6 months of age.
- e) identify standing estrus of sows/gilts correctly.
- f) submit under “flushing” by increasing feed by 50-100% or feeding of high energy, such as dextrose for 10–14 days before first service, that increase ovulation rate & litter size.
- g) have the best time for breeding gilts at first day and sows at second day in heat period and second service at an interval of 12-14 hours.
- h) remain sows and gilts in the mating area with daily boar contact to check for estrus for around 25 days after service.

- i) presume sow/gilts as pregnant, if once they pass 3 weeks without estrus signs and be moved to the gestating area.
- j) improve housing conditions and minimize seasonal and environmental stressors that may cause pregnancy loss.
- k) provide proper feeding to the gestating pigs to gain about 100 lbs prior to farrowing.
- l) prevent under or over conditioning of pigs for farrowing that can negatively impact on live-born piglets and feed intake in lactation.
- m) allow the sows/gilts to give birth in isolation, preferably in a farrowing room/pen/area and clean up and sterilize the farrowing area to make it contamination free applying approved disinfectant before and after farrowing.
- n) employ the correct technique, if farrowing requires assistance.
- o) practice a general sanitation program during the periparturient period.
- p) follow a disease prevention program against the diseases affecting reproduction.
- q) supply appropriate nutrition for both the dam and the newborns.
- r) provide suitable shelter and management for both the mother and the newborns.
- s) follow the 'National Guidelines on Good Livestock Production Practices'.

### **7.3. Use of Assisted Reproductive Technologies (ARTs) in Animal Reproduction**

Assisted reproductive technology (ART) can be defined as the procedure and technique that manipulate reproductive cascade including laboratory handling of human or animals' sperm, oocytes and/or embryos in order to contribute to the establishment of pregnancy with the final goal of producing healthy offspring.

Currently, Assisted Reproductive Technologies mainly include:

1. Artificial Insemination (AI);
2. Estrous Synchronization (ES) and Timed AI (TAI);
3. Superovulation;
4. Multiple Ovulation and Embryo Transfer (MOET);
5. Ovulation Synchronization (OvSynch) and Timed AI (TAI);
6. In Vitro Embryo Production (IVEP), which is consisting of
  - a) In Vitro Maturation (IVM),
  - b) In Vitro Fertilization (IVF),
  - c) In Vitro Culture (IVC);

7. Embryo Transfer (ET);
8. Intra-Cytoplasmic Sperm Injection (ICSI);
9. Gamete/Embryo Cryopreservation;
10. Semen/Embryo Sexing;
11. Gamete/Embryo Micromanipulation;
12. Gamete Intrafallopian Transfer (GIFT);
13. Zygote Intrafallopian Transfer (ZIFT);
14. Somatic Cell Nuclear Transfer (SCNT) or Cloning;
15. Transgenesis (Transgenic embryo production);
16. Xenografting Germ Cell Transplantation;
17. Preimplantation Genetic Diagnosis;
18. Genome Resource Banking, etc.

However, most of the assisted reproductive technologies and procedures are costly, great variation and intense practical limitations and that are the significant constraints to their widespread commercial adoption.

### **7.3.1. Poultry**

- a) Among ARTs, only AI is used in poultry to obtain high merit of genetic characters, increase the fertility in few cases or to maintain normal reproductive procedures where the normal breeding with natural mating is difficult to perform or impossible.
- b) Artificial insemination is widely used in the turkey industry to overcome low fertility in commercial turkeys resulting from unsuccessful mating due to the large, heavily muscled birds being unable to physically complete the mating process.
- c) The broiler industry has not adapted AI for several reasons of cost-effectiveness.
- d) Artificial insemination is used in layer chickens and ducks in Bangladesh in a limited scale.
- e) However, fertility and hatchability are lower in poultry eggs obtained from AI than that obtained from the natural mating.

### 7.3.1.1. Semen Collection from Poultry

- a) The male should be sexually mature for semen collection and at the age over 24 weeks.
- b) Food withdrawal from males for 12 hours prior to semen collection helps to prevent fecal contamination to the semen as bird's phallus and anus are located in a same duct.
- c) Clipping feathers from around the vent allows easy handling and access to male organ.
- d) When same manager collects semen regularly, the volume of semen will be maximum.
- e) Semen volume varies with species and individual variation of poultry.
- f) Semen collection can be done 3 times weekly or on alternative days.

### 7.3.1.2. Artificial Insemination (AI) in Poultry

- a) Artificial insemination is done through the vaginal route.
- b) Artificial insemination is done when the flock attains 8-10% egg production.
- c) Insemination to hens should be performed after 5 to 6 pm or after 2 to 6 pm.
- d) In chickens, because of the lower spermatozoon concentration and shorter duration of fertility, 0.05 mL of undiluted pooled semen is required to performed AI.
- e) Artificial insemination is performed at an interval of 7 days in chicken.

**Note:**

'Semen Collection and Artificial Insemination in Poultry has been described in Appendix 9.

### 7.3.2. Livestock

Currently applicable ARTs in the commercial livestock farms in the world are:

- a) Artificial Insemination (AI);
- b) Estrous Synchronization (ES) and Timed AI (TAI);
- c) Ovulation Synchronization (OvSynch) and Timed AI (TAI);
- d) Superovulation;
- e) Multiple Ovulation and Embryo Transfer (MOET);
- f) In Vitro Embryo Production (IVEP) consisting of
  - 1) In Vitro Maturation (IVM),
  - 2) In Vitro Fertilization (IVF),
  - 3) In Vitro Culture (IVC),
  - 4) Embryo Transfer (ET);
- g) Gamete/Embryo Cryopreservation;
- h) Gamete/Embryo Sexing;

But, the applicable ARTs in the commercial livestock farms in Bangladesh are:

1. Artificial Insemination (AI);
2. Semen Cryopreservation;
3. Estrous Synchronization (ES) and Timed AI (TAI);
4. Ovulation Synchronization (OvSynch) and Timed AI (TAI);

However, semen cryopreservation and AI are widely used mainly in cattle and buffalo, although ES and TAI, and 'OvSynch and TAI' are rarely used in the livestock in Bangladesh.

### **7.3.2.1. Semen Cryopreservation and AI**

#### **7.3.2.1.1. Cryopreservation of Livestock Semen**

##### **A. Semen collection**

1. Semen should be collected from the sexually mature, tested and proven males (bull/buck/ram/boar) using artificial vagina.
2. The male should be fit for sexual activities with good libido and body condition.
3. The male should be free from reproductive and venereal diseases.
4. Semen should be collected from the respective male with a recommended interval, although frequent ejaculation results in lower average semen volume.
5. Semen collection must be performed by a Registered Veterinarian, or in presence or under the supervision of a Registered Veterinarian/Animal Breeder.

##### **B. Semen evaluation and extension**

1. The collected semen should be free from hair, dirt, and other contaminants.
2. The collected semen must be evaluated for its color, pH, volume, consistency, sperm concentration, sperm motility, sperm morphology, sperm viability etc.
3. The semen found acceptable after evaluation should be extended for use as liquid semen as well as deep frozen/cryopreserved semen.
4. The semen is extended with the recommended extenders for the liquid semen and for the deep frozen/cryopreserved semen.
5. After extension, the semen must be evaluated again for the parameters mentioned in the point (2) before going to the next step.
6. The evaluation and extension must be performed either by or under the supervision of a Registered Veterinarian.

C. Semen dispensing and preservation

1. If the extended semen is found acceptable after evaluation, the recommended number of spermatozoa for the respective species are calculated for each dose of the liquid semen as well as for each dose of the deep-frozen semen.
2. Then, a single dose of the semen with the recommended number of spermatozoa are dispensed manually into the stoppered vials/tubes for liquid semen and into the semen straws by using a filling and sealing machine.
3. The liquid semen is preserved at 4°C in the refrigerator or in ice, where refrigerator facility is not available.
4. After filling of semen into the straws and sealing the open end of the semen straws, the straws with semen are gradually freezed using computerized biofreezer before immersed into liquid nitrogen in liquid nitrogen reservoir for long time preservation.
7. The semen dispensing and preservation must be performed either by or under the supervision of a Registered Veterinarian.

**7.3.2.1.2. Artificial Insemination (AI) in Livestock**

- a) The liquid semen should be used not more than 3 days after extension, but it should be examined every day before use for sperm viability, motility and morphology.
- b) If the sperm is found at an acceptable level in the liquid semen in terms of viability, motility and morphology, the semen should be used directly in AI, otherwise the semen must be discarded.
- c) The deep-frozen semen must be thawed in water at a recommended temperature for a particular time immediately after removing it from the liquid nitrogen.
- d) Immediately after thawing, the semen should be inseminated into the reproductive tract of the respective female using recommended AI device (e.g., AI gun).
- e) The AI should be performed as per procedure recommended for the specific species and by a Registered Veterinarian or by well-trained personnel.

## CHAPTER VIII

### BREEDER POULTRY FLOCK AND HATCHERY MANAGEMENT

#### 8.1. Breeder Poultry Flock and Hatchery Management

##### 8.1.1. Breeder Poultry Flock Management

- a) Breeder farm, a basic element of poultry farming that must be optimized at each stage.
- b) Genetic purity and ancestry of birds must be assured at the start of the breeder farm.
- c) Since the breeder stocks are costly, their hatching eggs and pullet chicks make higher income, so special care should be taken with the flocks to generate more profits.
- d) Attention should be given to the male management with the same priority that for the females, especially in broiler breeders.
- e) Male management should focus on control of skeletal development, body weight and feeding to produce enough quality males to maintain desired fertility and hatchability throughout the life of the flock.

##### 8.1.1.1. Chicken (Layer and Broiler)

###### 8.1.1.1.1. Management of Breeder Chicken Flock

- a) The layer breeder management is more or less similar to that of the commercial layers.
- b) But, the broiler breeder management faces challenges of over intake, overweight, aggressive mating by the male and not getting expected numbers of fertile eggs.
- c) The houses should be fully ECH for breeder flocks and the breeder flocks are usually housed on a fully littered floor during the rearing period.
- d) The breeder stock could be reared on deep litter, slats/wire, slat cum litter or in breeder cages during production period, and water is supplied on the slatted area and feed may be given on the litter or slatted area in slat cum litter floor.
- e) The floor space for layer breeder male and female should be required as 2.5 sq.ft. in deep litter, 2 sq.ft. on slat/wire floor, and 0.50 sq.ft. in cage for females and 0.75 sq.ft. for males in all types of breeder cases.
- f) The stocking density for the broiler breeder during the production period varies between 2.0 and 1.5 sq.ft./birds in slat cum liter floor.
- g) The chicks should be sexed (by automated sexing machine/device) just after hatching.

- h) Simultaneous to the sexing, the chicks are debeaked first in the hatchery and then the debeaking is again carried out at 12-14 weeks of age.
- i) Vitamin K in water 1 day before debeaking, and electrolytes, anti-stressors with amino acids for 2 or 3 days from the day of debeaking should be supplied to the debeaked chicks or according to the instruction of the manufacturer/Registered Veterinarian/Animal Nutritionist.
- j) Both upper and lower beaks should be cut off straight, and 2mm beak from the nostrils should be left in females, but half of the beak between the nostrils and tip of the beak should be cut in males.
- k) Major criteria for monitoring birds for management purposes include body weight and uniformity, egg weight, hatchable egg production, eggs fertility, and hatchability.
- l) Chicks' weight should be measured weekly to set growth curves and targets, and the chicks should be maintained in groups according to the body weight from 4 weeks of age with the weak chicks receiving extra care to attain uniformity.
- m) Body weight of each pullet must be increased before 7-8 weeks of age to become good breeder until the end of the flock, and so it is strongly recommended to weigh the pullets weekly for growth evaluation.
- n) However, the body weight could be influenced by the change of feed, the adaptation of the lighting program, the vaccination schedule and the environmental stress.
- o) Body weight and flock uniformity are important indicators during rearing period, especially during the period between 15 weeks of age and the photo-stimulation.
- p) Flock uniformity is a major goal of the breeding flock for peak egg production and for a smaller number of culls, and that must be over 80% at any stage of the flock.
- q) Body weight, uniformity, behavior and libido of the breeder males must be monitored and controlled regularly.
- r) Males and females should be raised separately until 17-23 weeks, and males should be present in the breeding flock at 17 weeks of age in case of layer and at 23 weeks in case of broiler at a ratio of 1:10 to 1:7 (male:female) respectively.
- s) Lameness, weak, sick, unhealthy and inactive males should be replaced promptly from the flock by younger, healthy and vigor males to maintain the higher fertile egg production.
- t) Lameness, weak, sick and unhealthy females, if required, should be replaced promptly from the flock by uniformly healthy females to maintain the higher fertile egg production.

- u) Broiler breeder males show rough and aggressive behavior to females during mating leading to feather and skin damage and fearfulness in females resulting in less interest of females in mating leading to increased number of unfertile eggs.
- v) Males should be allowed more space reducing stocking density to perform more courtship and more successful mating resulting in more fertile egg production.
- w) In case of AI, at least 5% males that can yield about 0.5 ml of neat semen per ejaculate with not less than 60% sperm motility should be maintained.
- x) Females should be inseminated every 5-7 days, with 0.03 – 0.05 ml of neat semen within 30 minutes after collection.
- y) Hens could also be artificially inseminated with pooled and extended semen following the approved procedures.
- z) Eggs from the flock before 26 weeks of age should not be set out for incubation.
- aa) Nest temperature should be that of the incubator and the collected fertile eggs should be cooled to 21-25°C, which reduces embryonic mortality.
- bb) Floor eggs should not be mixed with nest eggs to avoid contamination and manual disinfection and cleaning of collected fertile eggs should be performed as directed by the Registered Veterinarian/Hatchery Expert/Breeding companies.
- cc) The recommendations of the breeding companies regarding the ideal temperature and humidity should be followed to ensure the viability of the collected fertile eggs.
- dd) Training should be provided for the personnel to promote hygiene during the collection of fertile eggs and care in their handling.
- ee) The management guides of the breeding companies are usually taken as the basis for stocking density, lighting program, feeding program and so on.
- ff) Health management, medication, deworming and vaccination of the layer and broiler breeder flocks must be performed as per the advice of a Registered Veterinarian (Appendix 30 and 34).

**Notes:**

1. Recommended stocking density of layer breeder chicken has been presented in Appendix 10.
2. Recommended temperature for layer breeder chicken has been shown in Appendix 11.

**8.1.1.1.2. Feed and Body Weight Management**

- a) The feeds of the layer breeder flocks are more or less similar to that of commercial layers in respect of major nutrients.
- b) In the layer breeder farm, *ad libitum* feed should be provided during the first 4 weeks of age and then, the feed should be given based on body weights and requirements.
- c) The broiler breeders require a minimum cumulative nutrient intake before photo-stimulation to sustain subsequent egg production and fertility during the production cycle in females and reproductive performance in males.
- d) Good quality feed and potable and safe water that free from pathogen and mycotoxin must be supplied to the breeder stocks.
- e) Sex separate feeding should be given to the breeder flock for their nutritional differences offered in separate hoppers in the slat and deep litter system.
- f) But the sex separate feeding could not be accurately maintained in floor system whereas that can be achieved with 100% accuracy in cage system.
- g) The breeder hen feed must be enriched with all micronutrients, 18% protein and 3.0 to 3.5% calcium while the cocks be fed with 13-14% protein and 1-1.5% calcium feed with higher levels of vitamin E (40mg/kg feed) in order to obtain high rates of fertility and hatchability besides high egg production.
- h) Low daily protein intake during the rearing period and the first phase of the production period generally result in an inferior feather cover compared to diets with medium or high protein content at these periods.
- i) To develop the layer bird's appetite and growth, it is recommended to keep the feeders empty or beyond the reach of the birds in the middle of the day from 4 weeks of age that stimulates a fast-daily intake of feed during the rearing period.
- j) Optimal feeder and drinker space per bird with almost an even and moderately fine feed should be provided in the breeder farm that ensures even growth of the flock by equal feed consumption of all birds.
- k) Feed and water restriction should be applied during the rearing period to the fast-growing broiler breeder to control body weight of the chickens.
- l) Broiler breeders in controlled feeding programs take longer to reach sexual maturity that results in increased egg production, improved egg quality, increased fertility, improved hatchability, and reduced mortality.

- m) Feed restriction should be applied either providing daily or a skip-a-day feeding regime.
- n) The broiler males should be less restricted feeding during rearing period than females, but male should be more restricted during the production period than females.
- o) Feed and water restriction in broiler breeders could be applied during the production period to control the body weight, but the restriction level should be much less severe as compared to the rearing period.
- p) Overweight of the breeder birds can also be controlled by increasing fiber or decreasing energy and protein in the diet.
- q) When water restriction is applied, water is usually provided around feeding during a few hours after feeding, and possibly on other occasions during the day.
- r) However, water requirement may increase according to the ambient temperature in case of houses that not built as environment-controlled house.
- s) In hot weather, feed should be given at the cooler part of the day (i.e., in the early morning and at the late evening).
- t) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens like *Eimeria spp.*
- u) Intestinal optimizer pro-nutrients contribute to improving digestive function, reducing the incidence of dirty fertile eggs in breeder farms.
- v) Recommended biotechnological tools like probiotic, prebiotic, enzymes, essential oils etc. could be used in feed to improve the feed to enhance feed digestion & utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.

**Notes:**

1. Pro-Nutrients is a new dietary supplement that includes Omega-3, Probiotic, and Fruit and Veggie and these 3 supplements support health and well-being.
2. Nutrient requirements for layer breeder of different age groups has been shown in Appendix 13.

**8.1.1.1.3. Lighting Management**

- a) Lighting in the poultry houses favors the feed consumption, and development of the immune system, digestive system and the reproductive system of the birds.
- b) Lighting in the chicken breeder farms is an important aspect that should be carefully managed to obtain the best reproductive performance at peak production.

- c) Starting rearing chicks should be with the lighting of 40-60 lux for 18-20 hours and a gradual decrease of lighting both in time and intensity should be made with time.
- d) An intermittent lighting for 16 hours with at 30-50 lux should be used during the first 2 weeks of age to synchronize the chicks' behavior for eating, drinking and resting.
- e) After 2 weeks of age, lighting should be provided uniformly for 8 hours with 10-15 lux intensity until 20-21 weeks of age when the birds are to be moved to the laying area.
- f) Duration of light could be from 8 to 12 hours with the same intensity according to the pullet growth, but the actual age to increase lighting length from short (8 hours) to long ( $\geq 11$  hours) depends on the average flock body weight and flock uniformity.
- g) The light should be increased after 20-21 weeks of age when the birds are sexually mature and in ideal physical condition for breeding, but the light stimulation (light increasing) should not start before the flock reaches 5% of lay, although high lighting increases reproductive performance.
- h) After 20-21 weeks of age and 5% of lay, the lighting period should be increased from 12 hours to 16 hours by gradual increasing with half an hour daily with increasing the light intensity from 10-15 lux to an average of 30 lux at the level of the feed trough.
- i) However, maintaining high egg numbers and fertility throughout the production cycle depends on body weight and flock uniformity at photo-stimulation.
- j) The purpose of short light period is to sensitize the pullet's brain to better control of feed consumption and growth leading to efficient egg production when the pullet is exposed to long light period.
- k) Properly sensitized birds with correct light management complete their final sexual maturity and come into production on time that are vital to be efficient egg producers.
- l) However, the short light period can be achieved by exposing the growing pullets to 8 hours per day using either artificial or natural light.
- m) When using natural light, the curtains are raised or lowered to provide the light and dark periods, but when using artificial light, the curtains are either raised permanently or the sidewalls are solid.

**Notes:**

1. Recommended lighting program in light-controlled rearing and laying houses has been presented in Appendix 14.
2. Recommended weights, feed intake, egg production, hatchability, mortality etc. have been presented in Appendix 15 as 'Layer Breeder stock performance potential Traits'.

### **8.1.1.2. Duck**

#### **8.1.1.2.1. Management of Breeder Duck Flock**

- a) The breeder duck can be managed in extensive, semi-extensive and intensive systems for commercial fertile duck egg production.
- b) Stocking density of duck is of 4-5 sq. ft./birds in intensive production systems in the ECH.
- c) In semi-extensive and extensive system, a duck requires 3 sq. ft. in the night shelter.
- d) In extensive system the stocking rate suggested is about 5000 ducks per hectare, but it is preferable to rear them in smaller units of 200 ducks. In contrast, 10 to 15 sq. ft. are required per duck as outside run in the semi-intensive system.
- e) In semi-extensive or extensive production systems, animals often have access to water for bathing when they have a higher risk of mortality from predators and higher risk of infection of diseases transmitted by wild animals, such as HPAI.
- f) Despite this, in the semi-extensive or extensive production systems, the economic investment for housing and the lighting costs are lower and also satisfactory and profitable than the intensive production system, and the ducks have better bone density because they have greater mobility.
- g) The feeding costs are reduced in the semi-extensive or extensive production systems, since the feed can be supplemented from the nature with the intake of small animals present in the water body (e.g., pond, canal etc.), such as insects, frogs, fish, or snakes.
- h) Ducks have the nature to go into the water if they have access to it, but the ducklings younger than 1 month of age should not have access to water because their plumage does not have the ability to repel water like adults and they could quickly lose their body temperature and vitality.
- i) Ducks are generally pastoral animals that have a lower incidence of diseases than other domestic birds and can easily adapt to simple, low-investment housing.
- j) Ambient temperature must be controlled in ducklings, since they cannot initially regulate their body temperature and the room temperature should be around 28°C at the arrival to avoid prostration and starvation problems of ducklings.
- k) The behavior of ducklings should be evaluated to regulate the temperature by raising or lowering the light according to their needs.
- l) The duckling should start drinking and eating within 36 hours of their birth.
- m) The differences of sexes begin in ducks after 3 weeks of age depending on breeds.

- n) Beak trimming should also be performed in some breeds of ducks, particularly in Muscovy ducks, due to their dominant beaks.
- o) It is important to know the growth curve and to adjust it to the nutrient requirements, if the ducklings grow too fast, they can develop locomotion and lameness problems and grow slower that should be adjusted with nutrition and/or feed intake.
- p) Ducks have superior compensatory growth capacity than other birds, so growth losses at the start of the cycle can be recovered from 4 weeks of age.
- q) Separate rearing of male and female of the breeding ducks should be preferred.
- r) Male to female ratio during production period should be 1:4 or 1:5 to maintain fertility.
- s) Health management, medication, deworming and vaccination of the duck breeder flock must be performed as per advice of the Registered Veterinarian (Appendix 30 and 34).

#### **8.1.1.2.2. Feed and Body Weight Management**

- a) Feed quality, the amount of feed consumed and the rate of body weight gain are extremely important in determining the rate and number of eggs produced.
- b) Ducks can adjust feed intake based on the energy content of the diet, so formulations of medium or low energy can be used from 4 weeks of age, however, ducks usually have an FCR close to 3.
- c) Protein concentration of the diet ranges from 12 to 18% from 3 weeks of age till the end of the production cycle.
- d) The ducklings should be raised separately from older breeder flocks to ensure proper nutrition, disease control, and lighting management.
- e) The competitiveness for feed can have a negative impact on females in case of male and female mixed rearing, so it is recommended to raise females and males separately.
- f) Drakes are very aggressive in feeding resulting in uneven feed intake and weight gain among hens and drakes and drakes can often injure or even kill ducks.
- g) Ducks are known to require more vitamin A and nicotinic acid than broiler chickens, but the specific information for the species is not available.
- h) Ducks are particularly sensitive to the phosphorus deficiency in the diet, so addition of phytases in diet at equivalent to broiler dose [500 to 4,500 Finger-tip unit (FTU)/kg feed; Kriseldi *et al.*, 2021] can fulfill the phosphorus requirement (1 FTU is defined as the quantity of enzyme that releases 1  $\mu\text{mol}$  of inorganic Phosphorus per minutes from 5.0 mM sodium phytate at pH 5.5 at 37°C).

- i) Newly hatched ducklings should be given *ad libitum* feed for one week and the young breeder ducklings should be given feed with recommended nutrients in an appropriate amount to obtain the expected body growth rates (Appendix 21 and 22).
- j) A restricted diet controls the nutrient intake to prevent the gain of excess body fat and the breeder ducklings with target weights with age have been found to have superior egg production characteristics over breeder ducklings given feed continuously.
- k) Excessive body fat in ducks interferes with the function of the reproductive tract that can actually be happened as abdominal fat increases, however, overweight ducks produce about 20% fewer eggs than feed restricted ducks.
- l) Developing ducks should be fed developer diet with 15.5% crude protein, 2,932 Kcal/kg metabolizable energy (ME) and 1% calcium until the ducks begin to lay eggs (22 weeks).
- m) Crude protein and calcium are increased in the breeder layer diet of ducks to supply the additional needs for egg production.
- n) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens.
- o) Intestinal optimizer pro-nutrients contribute to improving digestive function, reducing the incidence of dirty fertile eggs in breeder farms.
- p) Recommended biotechnological tools like probiotic, prebiotic, enzymes, essential oils etc. could be used in the feed to improve the feed for enhancing feed digestion and utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.

**Notes:**

1. Phytase is an enzyme that specifically acts on phytate, breaking it down to release phosphorus in a form available to the animal. Phytate is the principal storage form of phosphorus in many plant tissues, especially bran and seeds
2. 'Basic Nutrition requirement for breeder ducklings and breeder layer ducks' has been illustrated in the Appendix 21.
3. 'Target weights and feeding schedules for duckling and breeder layer ducks' has been presented in the Appendix 22.

**8.1.1.2.3. Lighting Management**

- a) The reproductive performance of ducks is regulated by the length of lighting.
- b) Lighting programs generally consists of a combination of natural daylight and artificial lights in semi-intensive system to stimulate and maintain egg production and fertility in breeder duck flocks.
- c) Hatching of breeder duckling should be in June/July and when ducklings are hatched in June/July, they can use shorter duration of natural daylight until the ducklings are 22 weeks of age and then the light duration is extended to 14-16 hours per day (photo-stimulation) using the artificial lights in case of semi-intensive and extensive system.
- d) The daylength decreases by about 15 minutes each week from the middle of June to the middle of December while it increases by about 15 minutes each week from the middle of December to the middle of June.
- e) But in case of controlled intensive system, the duckling/duck/drakes should have per day light length of -
  - 1) 23-24 hours with 60-80 lux light intensity during the 1st week of age,
  - 2) 16-20 hours with 20-30 lux light intensity during 2nd and 3rd weeks of age,
  - 3) 14-16 hours with 10-20 lux light intensity during 4th to 7th weeks of age, and
  - 4) this lighting schedule (14-16 hours with 10-20 lux) is continued until the end of the production period.
- f) A light intensity of 10 lux can be provided using artificial light by using one 60-watt incandescent electric bulb for every 194 sq. ft. (18 m<sup>2</sup>) of floor space.
- g) However, it is also beneficial to provide dim light during dark periods to help prevent running when the flock is disturbed and to discourage feather pecking, but ducks can find feed and water in the dark as they are nocturnal animal.
- h) The extended light length beyond the daylength using in the extensive and semi-intensive system could easily be maintained by using artificial light with required light intensity either before sunrise or after sunset or both for rearing duckling, photo-stimulation of the duck/drake and maintaining egg production.

### **8.1.1.3. Producing Clean Hatching Eggs**

The following practices have proven to be useful in producing clean eggs for hatching and in keeping the eggs clean until they are set in incubators.

- a) Maintain birds on wire, or plastic or wooden slatted floors whenever possible, although some commercial strains of chickens do not produce eggs well in this environment and must have litter floors in part (i.e., litter cum slatted floor) or all of the house.
- b) Provide 1 nest for every 4 hens and be sure nests are in place before egg production starts to keep floor eggs to a minimum.
- c) Keep nests filled with clean nesting material, e.g., wood shavings, rice hulls, straw etc.
- d) Collect eggs frequently, at least 4 times a day.
  - a) Remove hens from nests or keep nests closed during night time to prevent hens from becoming broody and keep nests cleaner, and maintain litter dry at all times.
  - e) Collect eggs on clean, sanitized plastic flats or egg baskets.
  - f) Separate cracked, stained, heavy, or dirty eggs and don't incubate them.
  - g) Sanitize clean eggs as soon as possible after collection that kills microbes on the outside of the shell, but it does not kill all of the microbes that have penetrated the shell.
  - h) Always wash hands thoroughly with a disinfectant soap before handling eggs.
  - i) Cool eggs overnight in flats before placing them in cases and if eggs are to be stored, place them in a clean room held at 12.8° to 20.0°C (Day 1: 20.0°C, Day 2 to Day 4: 18.3°C and Day 5 or more: 12.8-15.6°C) and 75% relative humidity.
  - j) Prevent eggs from sweating (condensation of surface moisture) when they are moved from cold storage into a warmer room, but the sweating can be prevented by putting eggs in trays in a temperature-controlled room (18.3°C).

### **8.1.1.4. Fertility Disorders in Breeder Poultry**

There are a variety of possible causes for fertility disorders that are mentioned below:

- a) Insufficient number of active males that may be caused from overweight males, bad feet/legs of males, reduction of male-female ratio.
- b) Physiological castration- due to a very stressful event, some normal appearing males at housing may have been 'psychologically castrated' temporarily or permanently.
- c) Male aggression- Frightened females remain on the floor or hide in the nests resulting in reduced mating activity.
- d) Reduced feed intake of layer breed males- causes loss of body weight and thus loss of mating ability and semen quality.

- e) Increased feed intake by broiler breeder males- causes overweight and thus loss of mating ability and semen quality.
- f) Insufficient water consumption by males- hampers physiological activities and thus hampers the reproductive activity in males.
- g) Male disease or leg problems- these conditions do not allow male to mate correctly.
- h) Crowding- high bird density in the house can affect male mating and egg production.
- i) Male feeder space- decreased feeder space allow males to consume insufficient feed.
- j) Excessive feather loss - hens with excessive feather loss become tender (gentle/soft) and avoid the males by staying on the slats or hiding in nests.
- k) Overweight hens - affects fertility and this can be a problem in hot/humid weather in layer breeders, but usually found in broiler breeder hens.
- l) Rough appearing and/or non-uniform males at housing.
- m) Flock may have an excess of culls, 'crow-heads' and small males.
- n) Hot weather - both fertility and egg production can suffer from heat stress.

#### **8.1.1.5. Selection and Culling of Breeder in the Flocks**

- a) The birds with strong, fit, healthy and will be able to stand up to the rigors of breeding should be selected as breeder candidates and if the flock has been well managed up to the selection stage, the majority of the birds could be selected.
- b) Usually male should be selected for culling based on its vigor, successful mating ability, fertility, sperm quality and spermatozoa concentration in chicken and duck.
- c) Culling the inferior birds allows to reduce the egg production cost, reduce disease incidence and to provide more space for productive females in the house and feeder.
- d) Non-laying and low producing females and males with poor fertility must be culled.
- e) The females should be culled according to their percent of egg production and qualities.
- f) Unhealthy females and those with obvious defects like severe respiratory problems, drop crops, bad legs, severely swollen feet etc. must be culled out.
- g) Male that walks poorly, having bad posture, respiratory problems, breast blisters, drop crops, crooked toes or any other defect must be culled from the flock.
- h) Two types of culling are usually used: (1) sight culling at the time of housing and (2) culling by individual evaluation of laying ability or her past productive performance.

## **8.1.2. Hatchery management**

Hatchery management is a crucial part of the breeder farming, so additional necessary management activities in the hatchery need to be carried out more carefully.

### **8.1.2.1. Collection of Hatching Eggs and Management**

- b) As immediately after laying, the egg begins to develop an embryo in the egg, so sudden change in temperature and humidity should be avoided for survival of the embryo.
- c) In the slat or deep litter system, keep nest boxes at the rate of 1 box/box hole for 4-5 breeder females at 20-22 weeks of age in chicken and at 24-26 weeks in duck, and the nest should be closed at night to discourage broodiness and soiling of nest material.
- d) Eggs should be collected for hatching when they reach at least 50-55g weight or at 26-28 weeks of age, whichever is later, in both layer and broiler breeder chicken.
- e) Egg weights suitable for hatching are 55-60g in local/pati and Pekin ducks, and 70-90g in Muscovy duck, however, the eggs of pati ducks should be collected after 28-30 weeks of age for hatching.
- f) Eggs should be collected at hourly intervals in the forenoon and once at 2 hours in the afternoon in deep litter, liter cum slat and slat/wire floor, and 2-3 times a day in cages.
- g) In the cage system, netlon or rubber mat over the cage floor, or plastic-coated steel mesh should be used to prevent hair cracks in hatching eggs.
- h) The eggs from the nest and the floor (soiled, dirty, stained, broken, misshapen and abnormal eggs) should be separated soon after collection and cleaned accordingly.
- i) Floor eggs should not be mixed with nest eggs to avoid contamination.
- j) The lightly soiled or stained eggs should be cleaned with a small knife, a sand paper, dry cloth or cotton, but not by washing in water for setting.
- k) The collected hatching eggs should be cooled at recommended temperature and humidity for reducing embryonic death.
- l) The clean eggs with a sound shell with equal thickness, appropriate shape, equal size and color that are 2 to 4 days old are ideal but up to 7 days of lying could be selected as hatching eggs.

- m) Non selected eggs should be discarded that can be sold for table purposes.
- n) The selected hatching eggs should be fumigated with potassium permanganate and formalin at 3X concentration (1g potassium permanganate and 3ml formalin), or be sanitized with an egg sanitizing machine or other recommended means at least 6 hours before setting and stored in an egg storage room.
- o) To achieve the best results, eggs collected for setting could be kept in a dry, cold, and airy environment for up to 7 days and not more than 3 days in hot temperatures.
- p) Eggs should be stored at about 13-14°C and at 75% (60-80%) of relative humidity [or at 12.8° to 20.0°C (Day 1: 20.0°C, Day 2 to Day 4: 18.3°C and Day 5 or more: 12.8-15.6°C) and at 70% relative humidity] keeping down the small end without any washing for (1-3 days for the best results) and up to 7 days of laying.
- q) The store must be dry, clean and free from any sort of contamination.
- r) There is an average loss of about 3% hatchability for eggs stored for 7 days and about 10% loss for those stored 14 days before setting.
- s) Hatching or incubation period of chicken eggs are 21 days, 28 days in local/pati and Pekin ducks, and 35 day in Muscovy duck.

#### **8.1.2.2. Incoming Hatching Egg Management**

- a) All incoming eggs should be sourced from farms certified by the competent authority.
- b) All eggs should be fumigated or sanitized prior to being set on the tray of the incubator.
- c) Eggs should be stored in a temperature and humidity-controlled room.
- d) Hatching eggs should be identifiable, and the hatching eggs and trays should be properly marked/labeled for traceability.
- e) Eggs from ducks should:
  - (1) be thick-shelled and crack-free;
  - (2) not be older than 5 days from the time of laying;
  - (3) be fertile.
  - (4) be placed in iron vat/cauldron with right temperature and humidity to maintain the embryo.

### **8.1.2.3. Hatchery Facility**

- a) The hatchery should be physically and operationally separate from poultry rearing facilities/unit, if the hatchery is within the poultry rearing establishment.
- b) The hatchery should be constructed and maintained to provide a safe and clean environment for the baby birds.
- c) The hatchery should be effectively ventilated, generally with mechanical means.
- d) Internal temperature of baby birds holding areas should be controlled and monitored.
- e) Surfaces within hatchery should be in good condition and can be easily cleaned.
- f) Drains in production areas should be accessible and easy to clean.
- g) Hatchery should allow normal behaviors, rest and effective inspection of baby birds.
- h) The hatchery should have a dedicated egg store, setter room and baby bird area with sufficient floor areas.
- i) An alternative power supply (e.g., standby generator) should be available which is capable of supplying all essential electrical systems within the hatchery.
- j) There should be an emergency water supply to the hatchery.
- k) Incubation equipment should have an alarm system in case of any trouble or failure.
- l) The hatchery should have enough arrangement and trained manpower for emergency management and troubleshooting.
- m) Electrical installations should be monitored regularly.
- n) Fire safety measures should be ensured in the hatchery.

### **8.1.2.4. Hatchery Operation and Management**

- a) The eggs should be set according to the demand or order for day old chicks/ducklings.
- b) Depending upon the size of the hatchery, the eggs are generally set 1 to 6 times a week.
- c) The remaining hatching eggs may be either sold as hatching eggs for other needy hatcheries or sold for table purpose.
- d) The male baby birds produced may be either sold for specialized male baby bird markets or destroyed and recycled in feed as “male chick meal”, replacing fish meal.
- e) The standard weight of a day-old chick and duckling should be between 32-35g for layer breed chicks and 35-38g for broiler breed chicks, and 39-42g for ducklings.
- f) Weak day-old chicks and ducklings and they weighing less than standard weight (as mentioned before) should also be discarded.

- g) Healthy day-old birds with standard weight should be vaccinated as per hatchery vaccination schedule.
- h) On the sanitation ground, the hatcheries should have an incubation tray cleaning room at least 30 meters away from the main hatchery, and the debris of the tray (egg shells, unhatched rotten eggs etc.) should be cleaned, disinfected and disposed of into a well-designed disposal pit.

#### **8.1.2.5. Transport of Day-Old Birds (Chick and Ducking)**

- a) The transport of day-old birds from the point of origin to the final destination should follow a planned route and be done in a manner that does not cause stress throughout the journey and does not predispose them to injury and disease.
- b) Transportation of day-old birds should be carried out at the coldest time of the day preferably in the morning in order to avoid heat stress.
- c) The transport of day-old birds from their point of origin to the final destination should be through the most direct and appropriate route that should be completed without unnecessary delay.
- d) During transport, suitable space & ventilation should be provided to the day-old birds.
- e) Eggs and day-old birds should be transported in the purpose-built specific vehicles.
- f) Vehicles used for transporting eggs/day old birds should be cleaned and disinfected before and after use.
- g) A transporting vehicle cleaning and sanitation policy should be in place.
- h) Transport of day-old birds should follow the regulations of the competent authority.
- i) A transport or movement permit should be obtained prior to shipping day-old birds with an animal health certificate signed by a Registered Veterinarian.
- j) Vehicles used to transport hatching eggs and day-old birds shall be registered with and accredited by the competent authority (Bangladesh Road Transport Authority, BRTA).

#### **8.1.2.6. Records and Documentation**

- a) Day old birds should be identified and recorded properly to maintain traceability.
- b) A documented plan for the management of incidence of potential emergency situations that threaten the welfare of workers, birds or environment should be in place.

## CHAPTER IX

### COMMERCIAL POULTRY FLOCK MANAGEMENT

#### 9.1. Commercial Poultry Flock Management

##### 9.1.1. Brooding Management of Commercial and Breeder Flocks

- a) The brooding management of commercial and breeder poultry flocks are almost similar, hence the guidelines of both the flocks have been mentioned under this section.
- b) The brooding period is generally from hatching of chicks and ducklings to their 3-4 weeks of age depending on the environmental temperature, species and breeds.
- c) Brooder houses and equipment should be well cleaned, disinfected and dried at least 7 days ahead of placing the baby birds into the brooder.
- d) If the brooder house is airtight, i.e., ECH, it should be fumigated and the equipment by using a 3 times higher concentration of formaldehyde gas at least 48 hours before bird's arrival and the fumigation gas should be expelled out from the airtight house before bird's arrival.
- e) The brooding house should provide adequate protection of birds from predators, pets, stray or other animals and birds, and enemies.
- f) Brooder guard, litter, feeder, waterer, paper sheet for feeding, heating, lighting and other equipment should be placed in the brooder house at least on the previous day of the bird's arrival.
- g) Brooder guard should be at the proper height made from convenient and cheaper material, easy to clean and sterilize, prevent chilling and piling, and ensures birds stay near the heat source.
- h) A good brooding period is key to developing the gut, immune system and the skeleton, to improve flock livability and to obtain productive and high-quality young flock.
- i) Litter temperature should be preheated and stabilized 12-24 hours before placement of the day-old birds depending on the season, region and outside temperature.
- j) Litter material should be spread about 2 inches high in a circle and then spread papers or thin sheets over the litter material for placing the initial feed granules.
- k) Day-old birds should be taken from good quality hatchery maintaining good health with the criteria of birds mentioned under the section **4.1.1.1.2.** and **4.1.1.2.2.**

- l) Pre-brooding vaccination should be done in the hatchery, or in the farm after receiving the day-old birds.
- m) Optimal brooding requirements should be provided to the birds, such as optimum temperature (Appendix 11), quality feed (Appendix 12), light (Appendix 14), humidity (60 to 70%), quality air (fresh air), adequate ventilation, safe and potable water (Appendix 23 and 24), etc.
- n) Appropriate floor space (Appendix 10) and spaces for feeder and waterer (Appendix 12) should be provided to the birds.
- o) Feeders and waterers should be regularly cleaned, disinfected and dried, and changed for higher size or increase the number of the feeders and waterers with the growth of the birds to provide the recommended space for the feeder and waterer (Appendix 12).
- p) The brooding birds should be supplied recommended feed and clean drinking water.
- q) The brooding birds should have continuous free access to the feed and water, and the feed and water consumption of the birds should be monitored regularly.
- r) Optimal brooding temperature should be uniformly kept in each area of the brooder.
- s) Brooding temperature should be checked manually at bird's level 3-4 times a day.
- t) Litter should be properly maintained so as not to be very dry or wet tending to form cake due to higher moisture level and/or leaking or dripping water from the waterer.
- u) Wet areas under waterers and other areas of the litter should be replaced by fresh litters.
- v) Proper ventilation should be provided to maintain the acceptable level of O<sub>2</sub>, CO<sub>2</sub>, CO, NH<sub>3</sub> etc. in the brooding areas.
- w) Levels of O<sub>2</sub>, CO<sub>2</sub>, NH<sub>3</sub> etc. gases in the brooding areas should be monitored regularly at the bird's level.
- x) Recommended lighting programs (Appendix 14) should be provided in the brooder for stimulation of feed and water intake of the birds, which should be reviewed constantly.
- y) Bird behavior should be observed closely and frequently, if necessary, suitable action should be taken.
- z) The best quality and approved supplements, medicines and vaccines should be used for the brooding birds as per recommendation and with the supervision of a Registered Veterinarian (Appendix 30).
- aa) Debeaking should be done especially in the layer and breeder chicken at 10-12 days of age, if not that done in the hatchery.
- bb) Brooding guard and the brooding area should be adjusted regularly based on the age and weight of the birds providing the recommended floor space.

- cc) Weekly body weight of birds should be taken proportionately from every corner of the brooding area/house and if necessary, the feed should be adjusted to gain the target body weight of the birds.
- dd) Birds with lower weight than the target weight should be separately reared with high energy and protein, and vitamin and mineral supplements as per advice of a poultry nutritionist or a Registered Veterinarian.
- ee) Appropriate management of the brooding birds should be done to ensure uniformity of birds for good production, but any mistake in the first 3 days can never be overcome.
- ff) The birds with appropriate weight, good looks and normal behavior, and body structure should be selected as grower.
- gg) The selected birds should receive recommended levels of vitamin and mineral supplement for at least 3 (preferably 5 to 7) days prior to transfer to the grower house.
- hh) The birds should be transferred to the grower house at the age of 10-12 weeks of age at the time of the day when the ambient temperature is cool not causing extra stress.
- ii) Performance of the brooding house and birds should be recorded properly.

**Notes:**

1. Temperature for layer breeder chicken is almost similar to that for the commercial chicken, which has been presented in Appendix 11.
2. The nutritional requirements for commercial chicks have been shown in Appendix 16.

**9.1.2. Commercial Layer Flock Management**

**9.1.2.1. Layer Grower (and Pullet) Management**

- a) From 3 (or 4) to 12 weeks of age, the birds (chicken and duck) are in growing stage, from 12-22 weeks of age, they are referred as pullets in chicken, and the pullets should be reared in the grower house up to 18 weeks.
- b) The growing stock of duck is referred as grower duck after brooding to the laying stage.
- c) The grower house and equipment should be properly cleaned, disinfected and dried before introduction of grower birds.
- d) If the grower house is airtight, i.e., ECH, it should be fumigated by normal concentration and the equipment by 3 times higher concentration of formaldehyde gas with potassium permanganate and formalin at least 48 hours before arrival of birds and the fumigation gas should be expelled out from the airtight house before bird's arrival.

- e) The grower birds should be reared allowing them the recommended floor space (Appendix 10), space for the feeder and waterer (Appendix 12), temperature (Appendix 11), humidity, light (Appendix 14), etc.
- f) Litter material should be placed on the floor at a height of 4 inches in case of the deep-litter system, and feeders and waterers should be placed and arranged in the grower house according to the requirements.
- g) Lighting systems should be appropriately installed in the grower house according to the demand of the recommended lighting programs (Appendix 14).
- h) Ventilation and humidity systems should be installed and checked for functionality.
- i) Lights, ventilation and humidifier of the grower house should be started and checked for the recommended light (Appendix 14), temperature (Appendix 11) and relative humidity (60 to 70%) prior to transfer of birds.
- j) Feed and water should be provided for the birds immediately prior to arrival of the birds.
- k) Birds should be provided with the well-balanced, fresh recommended feed with appropriate nutrients to align with the age and stage of development of the birds.
- l) The birds should be provided with recommended immune booster, anti-stressors, vitamin and mineral supplement for at least 3 (preferably for 5) days prior to their arrival at the grower house.
- m) Fresh, clean and cool drinking water should be supplied to the birds and be careful that the water temperature should not be higher than the body temperature of the bird (Appendix 23 and 24).
- n) Recommended water pressure in pipeline of nipple drinking system for ECH/grower house should be applied and monitored regularly.
- o) For floor rearing system, required space of feeder and waterer should be provided to the birds according to their age and stage of development of (Appendix 10).
- p) Litter should be appropriately maintained so as not to be very dry or wet tending to form cake due to higher moisture level and/or leaking or dripping water from the waterer to the litter.
- q) Wet areas under the waterers and other areas should be replaced with fresh litters.
- r) Proper ventilation should be provided to the grower house to maintain the acceptable level of O<sub>2</sub>, CO<sub>2</sub>, CO, NH<sub>3</sub> and aeration, and be monitored regularly at the bird's level.
- s) Recommended lighting programs (Appendix 14) should be provided to birds in the grower house for stimulation of their feed and water intake, and gaining sexual maturity.

- t) Recommended vaccination, medication and other health management programs like deworming etc. should be strictly followed for the growers as per advice of Registered Veterinarian (Appendix 30 and 34).
- u) Bird's behaviors should be observed and evaluated regularly to take needful actions.
- v) Body weight at random proportionate sampling (at least 5% of whole flock) should be measured weekly and evaluated, if it does not fit to the standard, the nutrients of the diet should be adjusted as per requirement.
- w) However, mid night feeding could be a good solution to achieve standard body weight during the summer season in the houses that are not temperature-controlled to encourage feed intake in a comparatively cooler environment avoiding the hotter ambient temperature during the day time.
- x) Group feeding programs should be adopted for both under- and over-weight birds.
- y) Underweight birds should be supplied feed with high energy and protein added with vitamins and minerals as per the advice of poultry nutritionist/Registered Veterinarian.
- z) Restricted feeding program in grower birds should be adopted to prevent fattening and early sexual maturity of the growers for improved egg production in the laying stage.
- aa) Feeding programs should be carried out to achieve at least 85% uniformity of the pullets at 18 weeks of age that is essential for the expected egg production during laying stage.
- bb) It is advised to adjust nutritional management in order to reach target body weights of pullets at 6, 12, 18, (and 24, 30) weeks of age.
- cc) Management and nutrition of the birds should be aimed at reaching an optimal bodyweight and uniformity at the start of the egg production.
- dd) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens like *Eimeria spp.*
- ee) Intestinal optimizer pro-nutrients could be used to the feed to improve the digestion.
- ff) Recommended biotechnological tools like probiotic, prebiotic, enzymes etc. could be used in the feed to improve the feed for enhancing feed digestion and utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.
- gg) Selective culling for the injured, sick, aggressive birds should be applied to achieve the expected uniformity of the flock.
- hh) Excitement, stress, stocking density should be reduced, and feed be adjusted according to the nutrient requirements to prevent feather pecking and cannibalism.

- ii) The birds with appropriate weight, good looking, and with normal behavior and body structure should be selected for laying and getting ready to be shifted to the layer house.
- jj) The selected birds should be provided with recommended vitamin and mineral supplement from 3 days prior to transfer and after transfer to the layer house.
- kk) The pullets should be transferred at 18-20 (or 16-18) weeks of age at the time when the environmental temperature is cool causing least stress.
- ll) The duck growers should be transfer at the recommended age and body weight at the similar time as done in case of pullets.

**Note:**

The nutritional requirements for commercial pullets (grower mash) have been shown in Appendix 17.

**9.1.2.2. Commercial Laying Flock Management**

- a) Commercial laying flock is reared for commercial production of eggs for table purpose.
- b) The layer house and the equipment should be properly cleaned, disinfected and dried well prior to introduction of layer birds into the layer house.
- c) If the layer house is airtight, i.e., ECH, it should be fumigated with formaldehyde gas and fumigation of the equipment by using a 3 times higher concentration of formaldehyde gas at least 3 days before arrival of the birds to the layer house.
- d) The layer birds should be reared with the recommended stocking density (Appendix 10), temperature (Appendix 11), relative humidity (60 to 70%), light (Appendix 14) etc.
- e) In the deep-litter, litter material should be placed on the floor at 5-6 inches height.
- f) Feeder and waterers should be placed and arranged in the layer house according to the need allowing recommended feeder and waterer space (Appendix 12) for each bird.
- g) Lighting systems should be correctly installed in the layer house as per the demand of the recommended lighting programs.
- h) Ventilation, humidity and cooling systems should be set and checked for functionality.
- i) Lights, ventilation, humidifier and cooler of the layer house should be started and checked for the optional light intensity, temperature and humidity prior to bird's arrival.
- j) In litter system, required numbers of laying nest boxes should be placed with suitable litter materials inside at the suitable places of the layer house with allocation of 4-5 birds per hole of the nest box or per nest box.

- k) Recommended layer feed with necessary ingredients, and clean, fresh and cool water should be provided for the birds nearly prior to arrival of the birds to the layer house.
- l) The birds should be provided with recommended vitamin and mineral supplement for 3 days prior and after arrival of the birds to the layer house.
- m) The birds should be reared under optimal lighting programs, temperature and humidity.
- n) Observation of the birds and their behavior by walking through the flock, and monitoring the management components should be performed regularly.
- o) In litter system, eggs should be collected at an hourly interval in the first half and at 2-hourly in the second half of the day, and the laying boxes should be regularly cleaned.
- p) Litter should be appropriately maintained so as not to be very dry or wet tending to form cake due to higher moisture level and/or leaking or dripping water from the waterer to the litter, and the wet litters under the waterers and other areas should be replaced with fresh litters.
- q) Proper ventilation should be provided to layer house to maintain the acceptable level of O<sub>2</sub>, CO<sub>2</sub>, CO, NH<sub>3</sub> and aeration and should be monitored regularly at the bird's level.
- r) Optional lighting (Appendix 14) should be provided to the layer house to stimulate feed and water intake, and to initiate, improve and sustain the egg production of the birds.
- s) After transfer of birds to the laying house, antibody titer of the flock against particular organisms should be measured against which the flock was already vaccinated.
- t) Recommended vaccination, medication and other health management programs like deworming etc. should be strictly followed as per advice of a Registered Veterinarian (Appendix 30 and 34).
- u) Feeding programs should be carried out to achieve at least 90% uniformity of the layer chicken at 22-24 weeks of age, which is essential for good egg production.
- v) In chicken, the nutrition should be adjusted to reach target body weights at 24 and 30 weeks of age that is required for uniform and long persistence egg production.
- w) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens like *Eimeria spp.*
- x) Intestinal optimizer pro-nutrients could be provided for improving digestive functions.
- y) Recommended biotechnological tools like probiotic, prebiotic, enzymes, essential oils etc. could be used in the feed to improve the feed for enhancing feed digestion and utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.
- z) Injured, sick, dead, aggressive and broody birds should be removed as soon as possible.

- aa) Excitement, stress, stocking density should be reduced, and feed should be adjusted according to the nutrient requirements to prevent feather pecking and cannibalism.
- bb) The layer birds should be supplemented with recommended anti-stressors like betane, vitamin C, sodium salicylate, zinc, vitamin E and amino acids when birds are at stress including heat stress due to high environmental temperature.
- cc) The management parameters should be regularly monitored and evaluated, if required, the management component(s) should be corrected and adjusted.
- dd) A complete record of laying performance of the flock should be kept for taking further necessary measures to keep the laying profitable.

**Notes:**

1. The nutritional requirements for commercial layer (layer mash) have been presented in Appendix 18.
2. The nutritional requirements for commercial old layers have been illustrated in Appendix 19.

**9.1.3. Commercial Broiler Flock Management**

- a) It should be necessary to mention that except in chicken, there are no broiler breed in Bangladesh in other birds, although there are some meat producing breeds in duck e.g., Muscovy duck, so, the guidelines will be described for the broiler breed of chicken.
- b) Brooding procedures of broiler chicken are more or less similar to that of the 'Brooding management' described under the section **9.1.1.** with a few variations, so only the variations in the brooding procedure of the broiler chicks are mentioned below.
- c) The broiler chicks are generally reared under brooder for 2-3 weeks as they are growing rapidly and total period of rearing is generally up to 4 to 5 weeks of age in Bangladesh.
- d) Day-old chicks should be taken from a reputed hatchery, which is maintaining good health with the criteria of birds mentioned under the section **4.1.1.1.2.**
- e) In case of broiler chicks, more care for litter management should be taken to maintain the litter, because they excrete feces with more water leading to more wetting of the litter in the brooding areas.
- f) However, the broiler chicks require more floor space and more space to the feeder and waterer with their growth than the layer chicks as they grow faster than layer chicks.
- g) Feeders and waterers should be changed with higher size or increase the number of the feeders and waterers with the growth of the broiler chicks to provide the optional space to the feeders and waterers.

- h) Brooding area should be increased regularly according to the age and body weight of the broiler chicks to provide the recommended floor space allowing the chicks to spread in a larger area of the same house with ultimate floor space of 0.5 sq.ft./bird.
- i) After completing the brooding, the heating equipment and the brooding guard are removed from the house, remaining all other equipment.
- j) No debeaking is done in the broiler chicks, as they are reared for a short period, and no restricted feeding program is allowed to them to obtain their maximum body weight.
- k) Appropriate management of the brooding broiler chicks should be done to ensure the weight uniformity of birds to obtain a good sale value.
- l) The target body weights of the broiler chicken are 1500 to 1600g by 4 weeks of age, 2000 to 2200g by 5 weeks and 2500 to 2700g by 6 weeks of age.
- m) The broiler chicks should be allowed to intake recommended high energy and protein diet with vitamin and mineral supplements to gain their weight rapidly.
- n) Optional lighting (Appendix 14) should be provided to the chicks for increased intake of feed and water to gain their target body weight within the particular time period.
- o) Ventilation, air quality, temperature and humidity in the broiler house should be provided as per instructions of the hatchery/poultry specialist/Registered Veterinarian.
- p) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens like *Eimeria spp.*
- q) Intestinal optimizer pro-nutrients can be given to the chicks to improve feed digestion.
- r) Recommended biotechnological tools like probiotic, prebiotic, enzymes, essential oils etc. could be used in the feed to improve the feed for enhancing feed digestion and utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.
- s) Recommended medication and vaccination (no deworming), and other health management programs should be strictly followed for the broiler chicken as per advice of a Registered Veterinarian (Appendix 30).
- t) The birds shall be immunized against common viral vaccines (ND and IBD) as a part of the disease prevention program as per vaccine manufacturers' instructions.
- u) After gaining the target weights, the chickens are sold, generally at a time, and All-In and All-Out system is recommended in the broiler chicken rearing.

**Note:**

The nutritional requirements broiler chicks have been shown in Appendix 20a, 20b and 20c.

#### **9.1.4. Commercial Meat Poultry Flock Management**

- a) Commercial meat chicken flocks are reared for 2 to 3 months, but the ducks are reared for 5 to 6 months intended to be used for table purpose.
- b) Generally, ducks are rarely reared for table purpose in Bangladesh, but they are usually reared for egg and duckling production, except for the Muscovy breed of duck.
- c) However, Muscovy ducks are not commercially reared in Bangladesh, so the guidelines of the commercial meat poultry flock have been described only for meat chicken flock.
- d) The male chicks of the commercial layer breeds and the Sonali breeds are generally reared as the commercial meat flock in Bangladesh, however, the commercial meat flocks are generally reared by the smallholders' farmers.
- e) Brooding procedures of commercial meat chicken flock are almost similar to that of the brooding management of commercial and breeder chicken flocks described under the section 8.1.1. with a few variations, so only variations in the brooding procedure of commercial meat chicken flock have been discussed.
- f) The smallholders generally use natural ventilation, electric bulbs for heating and lighting, and for movement and exchange of air, they use either ceiling fans or table fans in maintaining the meat chicken flocks.
- g) The farmers usually manage the light of the chicken house with a combination of the natural day light and the electric light.
- h) Ventilation is generally managed with natural ventilation, sometimes in combination with exhaust fans on the side fence/wall to maintain acceptable temperature, humidity and air quality of the meat chicken house.
- i) However, installation of heat-proofing ceiling could be helpful to maintain acceptable internal temperature of the meat chicken house.
- j) Recommended vaccination, medication including deworming and other health management programs should be strictly done as per advice of a Poultry Consultant/ Registered Veterinarian for the commercial meat flock (Appendix 30 and 34).
- k) After completing the brooding, the electric lights are used only for lighting the house raising the bulbs from the lower level to upper suitable level and the place of the table fans are readjusted to the suitable places, if required.
- l) Chicks are allowed to spread in a larger area of the same house removing the brooder guard to provide increased floor space (0.5-0.75 sq.ft./bird), and the feeder and

waterer spaces should be increased providing increased number or increased size of the feeders and waterers to allow optimal feeder and waterer space to the chicks.

- m) Debeaking and restricted feeding should not be allowed to this type of flock of chicks.
- n) The commercial meat chicken flock should be allowed to intake recommended feed and water *ad libitum* with vitamin and mineral supplements to gain their body weight within the target time.
- o) However, there is no specific commercial feed for the meat chicken flock in Bangladesh, but the farmers manage the flock generally with the commercial broiler feed.
- p) Pro-nutrients should be provided in feed to improve the immune system of poultry against environmental pathogens like *Eimeria spp.*
- q) Intestinal optimizer pro-nutrients can be provided to improve the digestive functions.
- r) Recommended biotechnological tools like probiotic, prebiotic, enzymes, essential oils etc. could be used in the feed to improve the feed for enhancing feed digestion and utilization, immunity and tolerance to stress, and thus ensuring healthy and productive birds.
- s) Recommended lighting programs (Appendix 14) should be provided to the chicks for increased intake of feed and water to gain their target body weight within 2-3 months.
- t) Body weight of the chicks should be taken weekly and chicks with lower body weight should be submitted to group feeding with high energy and protein ration to gain weight.
- u) The target weights of the commercial meat chicken are 650 to 750g by 2 months and 800 to 900g by 3 months of age.
- v) After gaining the target weights, the chickens are sold, generally at a time, and All-In and All-Out system is recommended in the broiler chicken rearing.
- w) As the price of the commercial meat chicken are higher than the broiler in the Bangladesh local market, the farmer can earn profit from it even feeding high priced broiler feed.

**Notes:**

1. Feeder and waterer space requirements for chicken is mentioned in Appendix 12.

## CHAPTER X

### HERD MANAGEMENT

#### 10.1. Management of Livestock Herd

##### 10.1.1. Pregnancy and Parturition Management

###### 10.1.1.1. Cattle and Buffalo

###### 10.1.1.1.1. *Pregnancy Management*

- a) Once an inseminated female is found pregnant that should be isolated in the last trimester from other animals to avoid any incidence or injury.
- b) Maternity pen/shed/area should be provided for the pregnant females, if possible individual pens for each pregnant animal should be arranged.
- c) The floor of the maternity pen/shed/area must be non-slippery and the overgrown hooves of the pregnant animals must be trimmed to ensure its good footing.
- d) Pregnant animals should have enough floor space for standing and sitting comfortably.
- e) The floor space about 32-40 sq. ft. (8.0-8.5ft. length x 4.0-4.7 ft. width) in addition 2 ft. length for feed bunk and 2.5 ft. length for gutter and walk alley (1.5 ft. vs. 1.0 ft.), however a total of about 50 to 60 sq. ft. are needed for a mature dairy cow (and heifer) depending on their body weight for their comfortable living and optimal production.
- f) Pregnant animals should be provided the ration that appropriate for the different stages of the pregnancy with consultation to a Registered Veterinarian to maintain their nutrition demand for maintenance as well as for the fetal development.
- g) Vitamins, minerals and other feed supplements should be offered to the pregnant animals as per advice of a Registered Veterinarian.
- h) Pregnant animals need to fed ration with correct nutrients to maintain pregnancy and prevent metabolic diseases and nutritional deficiencies, like negative energy balance (NEB) at periparturient and for expected milk production.
- i) Fresh and clean drinking water should be given round the clock to the pregnant animals.
- j) Regular hygienic management of the maternity pen/shed/area should be maintained to ensure healthier conditions avoiding infection.
- k) Pregnant heifers should be kept with milking animals after 6-7 months of gestation.
- l) Pregnant females should be clinically checked by a Registered Veterinarian at least once in every trimester to be sure about the health conditions of the mother and fetus.
- m) Cattle and buffaloes in the last trimester of pregnancy should be taken special care and not to be taken far away for grazing or in the uneven paths.

- n) Any clinical problem observed during the pregnancy, the animal should be checked and treated by a Registered Veterinarian.
- o) The animal should be allowed to sunlight 4-5 days before parturition to gain vitamin D.
- p) Paddy straw/soft rubber mat should be used as bedding before 4-5 days of calving.
- q) Animals should have special attention for calving signs toward the end of the gestation.
- r) Teats and udder should be checked by palpating for presence of any lump, if found any, the owner/manager should consult with a Registered Veterinarian immediately.

#### **10.1.1.1.2. Parturition Management**

- a) The pregnant cattle have the gestation period ranging from 273 to 292 days while pregnant buffaloes have that ranging from 305 to 320 days.
- b) The animal owner/farm manager should be aware of gestation period, careful during the last stage of gestation and be ready for management of calving, newborn and dam.
- c) Calving signs in cattle are increased restlessness, reduced feed intake and rumination, seeking for isolation associated with frequent postural changes, tail raising and greater frequency of lying bouts and these are more frequent in the last hours before calving.
- d) Signs of parturition in buffaloes are similar to those in cattle and they include reduced feed and water intake, restlessness, nervousness, frequent lying down, holding head high, paw the ground, raising tail, arching back, enlarged udder with engorged teats, enlarged & edematous vulva losing transverse folds, psychogenic watery diarrhea etc.
- e) During calving, the animal should not be disturbed but be observed from a distance.
- f) Normally the parturition process takes around 2 to 3 hours, but the primiparous animals may take 4 to 5 hours or more.
- g) Parturition involves 3 stages: Stage I- Preparatory stage, Stage II- Delivery of fetus and Stage III- Shedding of the placenta, hence 3 stages should be completed successfully.
- h) Generally, domestic animals do not need any assistance, but someone should be present all the time during calving looking for any emergency situation.
- i) If the parturition too delays and the condition goes beyond the control, a Registered Veterinarian must be consulted immediately.
- j) Sometimes, dystocia may result, if so happened, urgent veterinary help must be taken.
- k) After parturition, the genitalia and tail of the dam, and the newborn navel should be washed with warm water containing potassium permanganate (5% solution) or Neem leaves boiled in water (about 20 leaves in 1 liter of water until become soft and discolored and the water turns into green) or other approved antiseptic/disinfectant mixed water.

- l) The navel cord of the newborn should be cut by a disinfested sharp knife/new blade, if not detached normally followed by use of Tincture Iodine in the navel after detachment.
- m) Floor of the calving area should be washed off after parturition with disinfectant to avoid microbial contamination and flies.
- n) Just after parturition, the immunity of the parturient animal goes very low resulting the animal in very much susceptible to diseases.
- o) The parturient animals should be kept warm and provided warm water mixed with energy rich supplement like molasses.
- p) As the udder is swollen before parturition, it should be protected from injury.
- q) Placenta generally expels within 2 to 4 hours, but that may occur beyond 8 to 12 hours.
- r) If it (placenta) does not expel by 12 hours, a Registered Veterinarian must be consulted.
- s) The causes of retained placenta generally are disruption of normal parturition including abortion, dystocia and twins, and effects of diet, genetic or immunological causes.
- t) Care must be taken to avoid placenta ingestion by dam that causes reduced milk yield.
- u) After parturition, the animal starts milk production and there is a huge physiological change in the animal, so the feed provided to the dam should fulfill its nutritional requirements, but overfeeding should be avoided.
- v) As the newborn is totally dependent on its mother, it should be fed colostrum from the dam after expelling the first strip of colostrum that increases immunity of the newborn.

#### **10.1.1.2. Goat and Sheep**

##### **10.1.1.2.1. Pregnancy Management**

- a) When a bred/inseminated female goat/sheep does not return to estrus after 2 cycles she should be considered as pregnant.
- b) The pregnant does/ewes should not be handled frequently, be separated from herd and careful for their feeding in advanced stage of pregnancy.
- c) In case of the extensive and semi-intensive system, the floor space for the sheep and goat in the shelter should be 14-18 sq. ft./per doe and 16-20 sq. ft./ewe depending on the breed and body of the animals.
- d) But in the intensive system, the floor space for the sheep and goat in the stall should be 12-15 sq. ft./doe and 15-20 sq. ft./ewe

- e) Extra feed during the late part of pregnancy (3-4 weeks before parturition) will be beneficial for the periparturient ewes/does that will help in improving milk production, birth weight and growth of lambs/kids.
- f) Inadequate and poor nutrition in pregnant does/ewes may result in pregnancy toxemia, abortion and premature birth of weak lambs/kids.
- g) Does/ewes in the advanced stage of pregnancy should be kept in a separate shed 4 to 6 days before partition and maximum comfort like soft clean bedding (rice straw or soft rubber mat) and if possible, individual lambing/kidding pen should be provided.
- h) The pregnant does/ewes should be protected from adverse weather and predators.

#### **10.1.1.2.2. Parturition Management**

- a) The gestation periods of sheep and goats are very similar, as sheep give birth after 144-150 days and goats at around 150 (145–155) days of breeding.
- b) The animal owner/farm manager should be aware of the gestation period of the sheep and goat and be prepared for management of parturition, newborn and the dam.
- c) Parturition in sheep is called “lambing,” and it is referred to as “kidding” in goats.
- d) Parturition signs in sheep and goats are very similar to cattle and that are enlarged teats, nervousness, pawing at the ground, restless, and lying down, mucous discharge from the vulva, continuous bleating etc.
- e) A normal delivery usually takes 5 hours, when the cervix dilation usually requires 4 hours and then 1 hour is required for the delivery of the offspring.
- f) After water sac breaks, the doe/ewe should start to give birth within 30 min to 1 hour.
- g) If the doe/ewe is pushing very hard for longer than 30 min and a water sac or kid/lamb does not appear, the doe/ewe should be given assistance or a Registered Veterinarian should be contacted for further assistance.
- h) Generally, if the doe/ewe is still in active labor, pushing after having a kid/lamb and does not pass placenta/another kid/lamb within 30 min to 1 hour, assistance may be required, but they may take longer time between kids/lambs without problems.
- i) If the doe/ewe is cleaning up kids/lambs and appears comfortable for more than 1 hour, it may appear that the parturition is complete.
- j) Goats may have 1, 2, 3 kids, or rarely more while sheep may have 1, 2, or rarely more.

- k) The mother should be allowed to lick the newborns to clean up and to stimulate the newborns, then the newborn begin to vocalize, attempt to stand up within a few hours after birth and look for the udder to nurse.
- l) Warm cereal meal like gruel drink, should be fed to the parturient doe/ewe and if the milk is not sucked enough by the kids/lambs, the dam should be milked out soon to relieve her udder pressure in case of heavy milk yielders.
- m) If the poor milk yielder mother cannot fulfill the nutritional demand of the newborns, the newborns should be fed with cow/goat/sheep milk or approved milk replacers.
- n) The dam should be kept in a calm and protected place without disturbance from stray dogs and other animals and be waited for expulsion of the placenta.
- o) The placenta should be expelled after 12 to 18 hours of parturition, if not so, a Registered Veterinarian should be consulted for necessary remedy.

### **10.1.1.3. Pig**

#### **10.1.1.3.1. Pregnancy Management**

- a) Pregnancy is most commonly determined by noting that the sow/gilt does not return to estrus in 18 to 25 days of breeding and this can be 75% to 85% accurate.
- b) Floor space for pigs in the shelter for comfortable living should be 16-18 sq. ft./sow.
- c) As the embryos have the greatest risk of dying during the first 30 days of pregnancy, stresses to the sow/gilt like overfeeding, heat or cold stress, handling or moving, immunization etc. should be avoided during this period.
- d) Birth of less than 5 piglets is indicative of breeding failure or early embryo death.
- e) To increase colostral antibodies, the sow/gilt should be immunized against Foot and Mouth Disease (FMD), Classical Swine Fever (CSF) and if possible, against *Escherichia coli*, atrophic rhinitis, and erysipelas, etc. during the last 6 weeks of gestation.
- f) However, except the FMD vaccine, others are not available in Bangladesh at present.
- g) Feed restriction with low energy and high fiber through parturition and in the first few days of lactation appears to improve intestinal function and initiation of lactation.
- h) Feed intake during the last 2 to 3 weeks prior to parturition should be adjusted to avoid negative energy balance (NEB) and to promote easier parturition.
- i) Intravenous glucose injections at birth to the intrauterine growth restricted piglets enhance growth after birth.
- j) Higher feed intake of the sow/gilt in the early lactation reduces the risk of postpartum dysgalactia syndrome (PDS) and ensures satisfactory birth weights of piglets.

**10.1.1.3.2. Parturition (Farrowing) Management**

- a) Average gestation length of pigs is  $115 \pm 2$  days and is shorter in sows with large litters.
- b) The average gestation length of the herd and individual breeding dates of the sow/gilt must be known that allow to get prepared for the management of parturition.
- c) The pre-parturient period involves restlessness and nest building in the last 24 hours, swollen mammary glands and the mammary secretion changes from watery to milk.
- d) Swine parturition is called “farrowing” and the piglets are usually delivered at frequent intervals (average 10-15 min; range 5-45 min).
- e) The stillbirth rate usually is 5-10%, and intrauterine deaths are due to infection, incorrect position in the uterine horn during delivery or anoxia.
- f) Proper dose of Prostaglandin (PG)  $F_2$ -alpha must be used intramuscular (IM) route before 72 hours of the expected farrowing date to prevent increase in stillbirths.
- g) Anoxia occurs when the umbilical cord ruptures or becomes constricted because of the extreme length of the uterine horn or when there is a delay in farrowing.
- h) Any delayed birth of piglets due to exhaustion, uterine atony, dystocia etc. increases the chance of injury or death to the piglets still in the uterus.
- i) Assistance should be provided, if required, in the form of oxytocin (10–30 IU) IM injections in case uterine atony and manual removal of piglets.
- j) Walking the sow for a few moments and presence of an attendant to assist delivery can be helpful to born alive piglets in an increased number.
- k) Any difficulty in farrowing, assistance should be taken from a Registered Veterinarian.
- l) If induction is necessary to prevent late farrowing, it should be induced only in the sows/gilts that have not initiated labor by  $115 \pm 2$  days of gestation.
- m) Inducing farrowing increases sow mortality risk, but injection of dexamethasone after 24 hours of induction improves sow and piglet performance.
- n) Expulsion of the fetal membranes should occur within 4 hours of delivering the last piglet, if not so, a Registered Veterinarian should be consulted.

## **10.1.2. Periparturient, Lactation and Dry off Management of Livestock**

### **10.1.2.1. Periparturient Management**

- a) The period shortly before, during and immediate after parturition is termed as 'Periparturient' or 'Peripartum' or 'Transition' period.
- b) Clearly, the 6 to 8 weeks period centered on parturition (from 3-4 weeks before to 3-4 weeks after parturition), known as the Periparturient/Peripartum/Transition period.
- c) Pregnant cows should be 2.5-3.0 body condition score (BCS) at 2-3 weeks prior to calving.
- d) The cows should receive light, palatable, mild laxative feed for 2-3 days after calving.
- e) The animals should be supplied with an adequate amount of feed with high energy and protein during the last 3-4 weeks prepartum (before delivery).
- f) The periparturient animals should be fed adequate amounts of carbohydrate with good quality hay, silage or cereal grain up to at least the peak of lactation.
- g) The cows should be encouraged to intake more feed in the early lactation to meet the high energy demand for milk production to prevent NEB.
- h) Postpartum (after delivery) animals should be under close health monitoring during the peripartum for incidence of metabolic diseases (milk fever, ketosis etc.) as well as other disorders and diseases, like retained placenta, uterine infections, metritis etc.
- i) The dairy cows are susceptible to production disorders and diseases during the periparturient period and in the early lactation.
- j) The cows that are at risk of periparturient diseases should be separated prior to calving and be fed appropriately with required nutrition.
- k) Prevention and treatment protocol must be followed for all periparturient diseases like clinical/subclinical mastitis, milk fever, ketosis, retained placenta, uterine infections etc.
- l) Pregnant cows should be supplemented with magnesium from about 1-month pre-calving to peak milk production to prevent milk fever.
- m) The dietary calcium (Ca) levels should be kept low by providing low Ca in the diet and by avoiding feeding Ca rich forages (alfalfa) pre-calving that increases the response to higher demands of Ca to improve the efficiency of Ca absorption and mobilization.
- n) The dietary phosphorus (P) levels should be kept low pre-calving for 2-3 weeks prior to calving, which may increase absorption of Ca from gut and resorption of Ca from the skeleton and thus prevent drop of serum Ca during peripartum.

- o) The potassium (K) should be fed as low as possible (<1.5%) and its levels over 2% in the forage may predispose cows to milk fever.
- p) Anionic salts (eg. ammonium sulfate, ammonium chloride, magnesium sulfate) should be fed to dry cows, if there is difficulty in reducing Ca intake or if K levels exceed 2%.
- q) Large doses of vitamin D<sub>3</sub> or alpha-calcidol and oral Ca should be supplemented during the week before calving and the cows around calving should be supplemented with Ca.
- r) Mineral mixture with zinc, manganese, copper, cobalt and chromium (where allowed) should be provided in feed of the peripartum cows to boost up immunity.
- s) Females in areas with known deficiency of selenium must be provided supplementary selenium and other micronutrients to reduce incidence of postpartum complications.
- t) Antibiotics infusion should be given into all quarters of the cows 1 week prior to calving to prevent mastitis.
- u) Animals that give birth with dystocia should be monitored carefully because they are at greater risk of developing metritis, fever, hypocalcemia and prolapse of uterus/vagina.
- v) All types of stress and prepartum milking should be avoided in the periparturient cows and even pen movements should not be allowed, if not very essential.
- w) Major dietary changes during early lactation must be avoided that causes stress to the cows and can be shocking in the early lactation when the cows are suffering from NEB.
- x) All inflammations in the periparturient animals should be controlled, whether it is mastitis, lameness or other health issues.
- y) If the dam refuses to get up after 1-hour rest following delivery, the animal owner/farm manager should consult with a Registered Veterinarian for further instruction.
- z) Appropriate milking procedure including use of equipment and utensils following sterilization/disinfection before and after use, hygienic pre-milking teats preparation, stripping of foremilk before milking, consistent use of post-milking teat disinfection and milking mastitic cows last must be followed.
- aa) The animal owner/farm manager should maintain individual animal records of delivery history, health disorders, diseases and related matters for future references.
- bb) Pre-parturient shearing, deworming and vaccinations are suggested to perform in sheep and goats 1 month ahead of parturition (shearing in case of sheep and wool producing goats, but wool producing goat is presently not available in Bangladesh).

**10.1.2.1.1. Prevention and Management of Periparturient Diseases in Livestock**

**A. Milk Fever**

- 1) Milk fever is a metabolic disorder commonly occurring around calving usually within the first 24 hours post-calving, when the dairy cows, sows, sheep and goats have lowered levels of blood Ca (hypocalcemia), generally due to supplement more Ca in colostrum and milk production. It can also occur 2 to 3 days post-calving and be either clinical or subclinical.
- 2) Initial signs of milk fever include anorexia, agitation, excitability, muscle tremor, nervousness, weakness, hypersensitivity, and then shuffling of hind legs and turned head on the flank or head extended. Then staggering and subnormal temperature, laid down to a “sitting” position, often with a ‘kink’ in the neck and then dried muzzle, staring eyes, drowsiness, cold legs and ears and finally lying flat on the side, circulatory collapse, coma, and death.

**A.1. Animal owner/farm manager should be careful about the following risk factors**

- a) Parity of animals- higher parity poses the greatest risk for development of milk fever
- b) Breeds of animals- e.g., Jersey breed is with the highest risks (4.96 times) for milk fever compared to other breeds as it has increased Ca concentrations in colostrum.
- c) History of milk fever: animals with milk fever history are more prone to milk fever.
- d) Milk yield- high yielder produces more colostrum, and losses more Ca from the body via colostrum have a higher chance of milk fever than the lower yielder.
- e) Previous dry period length- animals with short previous dry period have less chance of postpartum drop in blood Ca compared to long (8 wks) previous dry period.
- f) Parturition season- parturition in July and May pose more risk of milk fever than in Dec.

**A.2. Animal owner/farm manager should adapt the following strategies for prevention**

- a) Ensure animals are at target BCS (cows BCS 2.5-3.0) 2-3 weeks prior to parturition.
- b) Separate at-risk animals prior to parturition and feed appropriately.
- c) Supplement animals with Mg from 1 month before parturition to peak milk yield.
- d) Keep dietary Ca levels low pre-partum period and avoid feeding forages high in Ca.
- e) Keep K levels as low as possible - ideally less than 1.5% in the forage.

- f) When reduced Ca intake or maintaining K levels at  $\leq 2\%$  is not possible, feed anionic salts (ammonium sulfate, ammonium chloride, magnesium sulfate) to dry animals.
- g) Supplement animals with Ca around parturition and colostrum production.
- h) Keep dietary P levels low pre-parturition period.
- i) Supplement large doses of vita. D<sub>3</sub>/alpha-calcidol & oral Ca a week before delivery.
- j) Prevent animals from over conditioning at parturition (not > BCS 2.5-3.0 in cows).
- k) Do not breed from cows or sires with a history of recurrent milk fever.

### ***A.3. Management of milk fever***

- a) First of all, it is important to seek veterinary assistance so the condition of the cow should be evaluated and diagnosed.
- b) The most common treatment for milk fever is the slow and intravenous infusion of calcium borogluconate (8 to 14g given as soon as onset of the clinical signs).
- c) Calcium borogluconate with magnesium and phosphorus are preferred for the disease (around 85% of cows respond well after single treatment).
- d) The solution should be warmed to cow's body temperature to maximize absorption.
- e) In most cases, the recumbent cows manage to rise within a few minutes after this treatment (Ca-borogluconate with Mg and P), while other treatments manage to rise the cow within a couple of hours later.
- f) The success of such treatment will depend greatly on the careful nursing of the cow.
- g) The recumbent cow should be kept sitting in a sternal recumbency position with soft support and be kept as warm as possible.
- h) The lateral recumbent cow should be turned carefully on the opposite side from the side on which it is recumbent preferably every 2-hourly.
- i) The milk fever cow should be properly sheltered, kept warm and fed carefully, and the cow's legs should be massaged from time to time.
- j) If no positive response observed within 6 hours post treatment, another intravenous infusion of Ca may need to be administered, or the diagnosis should be reevaluated.
- k) Milk fever may relapse between 18 and 24 hours, if so it should be similarly treated.

## **B. Ketosis or Pregnancy Toxemia**

- 1) Ketosis is a metabolic disorder that occurs due to an elevated concentration of ketone bodies, such as acetone, acetoacetate, beta-hydroxybutyrate in all body fluids, which are the metabolites of fat metabolism. It is generally called 'ketosis' in cattle and buffalo, and 'pregnancy toxemia' in the sheep, goat and pig.
- 2) When the energy demands (generally due fetal growth and high milk production) exceeds energy intake results in a NEB that leads to breakdown of body fat.
- 3) Signs of ketosis include anorexia, decreased milk production, noticeable loss of BCS, firm dry feces and occasionally, neurologic signs (nervous ketosis), and it may be clinical or subclinical and can be identified by routine testing of blood, milk, or urine.

### ***B.1. Animal owner/farm manager should be careful about the following risk factors***

- a) Parity of animals- cows at parity 3 or more are more likely to have risk of ketosis.
- b) Parturition season- during summer has a higher risk of ketosis than during spring.
- c) Herd size- smaller herd size have more risk of ketosis than the larger herd size.
- d) BCS at prepartum – animal over-conditioned prepartum has more risk of ketosis.
- e) Retained placenta- animals with retained placenta are tended to have risk of ketosis.
- f) Metritis- fresh animals having metritis are more likely to have risk of ketosis.
- g) Ketosis, lactation length, milk yield, and average milk protein % and milk fat % in the previous lactation- animals that have ketosis, prolonged lactation length, increased milk yield, lower milk protein % and higher milk fat % in the previous lactation are at risk of ketosis in the present lactation.
- h) Colostrum at the first milking- animals that produced increased colostrum at the first milking have increased risk of ketosis.
- i) Prolonged previous dry period - Prolonged previous dry period length is associated with increased possibility of ketosis in the present lactation.
- j) Dry-matter intake (DMI) - animals with lower DMI over the previous weeks are tented to have a significant risk of ketosis in coming week.

**B.2. Owner/manager should adapt the following strategies for prevention**

- a) Ensure feed supply that meets nutrient demand of the animals.
- b) Manage BCS both pre- and post-parturition to prevent over conditioning.
- c) High roughage intake during dry period can overcome reduced intake at parturition.
- d) Feed higher energy and protein diet with adequate amounts of carbohydrate, such as good quality roughage and concentrate from last 3 to 4 weeks prepartum to the peak lactation to prevent NEB.
- e) Avoid any major dietary changes during early lactation that causes stress to the animals and can be devastating when the cows are suffering from NEB.
- f) Avoid excessive energy and reduced fiber during early dry period (>28 days prepartum) and immediately postpartum.
- g) Supplement energy orally as propylene glycol or starchy concentrates (glucose precursor) to very high-producing cows immediately after calving.
- h) Deliver performance trace minerals (a complex trace mineral bonded to an essential amino acid) to cows during peripartum to boost up immune response.
- i) Feed Ca-propionate (propionate converted to glucose in liver), rumen-protected choline (component in transport of fat from liver) prepartum and/or postpartum and/or monensin postpartum (increase propionate by ruminal microorganisms).
- j) Provide zinc (improving gut integrity for 70% of animal's immune function), manganese (gluconeogenesis and play a role in Ca reabsorption), copper (immune function), cobalt (role in vitamin B-12 production, essential for gluconeogenesis) and chromium (if approved, glucose metabolism and insulin activity) in animal feed to prevent ketosis.
- k) Feed nutritional products like niacin and sodium propionate that help to prevent and manage ketosis in the last 2 to 3 weeks of gestation and during the early lactation.
- l) Avoid roughage with high butyric acid content to animals in the early lactation.
- m) Avoid stress due to pen movement, commingle heifers & cows, adverse weather etc.
- n) Control inflammation, e.g., mastitis, lameness etc.
- o) Provide comfortable accommodation to cows, easy access to feed using the bunk space, optimum voluntary intake, quality lying, rumination etc.
- p) Avoid heavy/rough handling of pregnant animals, especially in the late pregnancy.

**B.3. Management of ketosis**

- a) The main management of ketosis is the treatment of ketosis aiming at reestablishing normoglycemia and reducing serum ketone body concentrations.
- b) Oral administration (drench) of propylene glycol, a glucose precursor (250–400g/24 hours for 3-5 days) is the standard and most efficacious treatment, but overdosing of propylene glycol leads to central nervous system (CNS) depression.
- c) Vitamin B12 supplement (1.25mg IM/24 hours for 3 days) in cases of hypoglycemic patients as an adjunct treatment with oral drenching of propylene glycol, particularly in ketotic cows that are also hypoglycemic.
- d) Oral administration of propylene glycol after initial use of dextrose or glucocorticoids has excellent results in ketosis while IV/IM cortisone has extremely variable results.
- e) Glycerol can be used at up to 10-15% of the dietary dry matter (DM) and is well-established as a treatment for ketosis in cows.
- f) Additional therapy with bolus (a relatively large single dose) glucose treatment (500 mL of 50% dextrose solution, IV, as a single bolus) can be advised in neurologic cases.
- g) Only dextrose administration is recommended for nervous ketosis, but may not be necessary or even not helpful for every ketosis case.
- h) Other therapies that may be of benefit in refractory ketosis cases are continuous IV glucose infusion and tube feeding.
- i) Reducing milking frequency from twice a day to once daily will reduce ketone body concentration and improve the chances of recover from ketosis.
- j) In goat, the treatment consists of increasing the energy density of the diet and it can be done by feeding good-quality roughage and increased concentrate in early stages.
- k) Oral administration of propylene glycol 2-3 times/day may be beneficial in goats, but it may be toxic at high and repeated doses.
- l) Traditional treatments of ketosis in sheep include IV dextrose and oral propylene glycol, and additionally calcium, potassium, sodium bicarbonate, ionophores, flunixin, probiotics and thiamine could be supplemented.

### **C. Grass Tetany or Grass Staggers**

- 1) Grass tetany or grass staggers occurs when blood Mg levels fall below critical level (hypomagnesemia) in ruminants (cattle, sheep and goats) and is most common when pasture does not have much Mg or when increased body demands for Mg during lactation and/or late pregnancy. It is called 'grass tetany' in case of cattle and 'grass staggers' in sheep and goat.
- 2) Symptoms of the disease include restlessness, staggers, muscular spasms, seizures, respiratory distress, over-alert appearance, hyperexcitability, in some cases aggressiveness and in severe cases, fall down, convulsions, collapse and die without warning.

#### ***C.1. Animal owner/farm manager should be careful about the following risk factors***

- a) Grazing pasture or lush cereal crops, often without any hay supplementation.
- b) Low roughage intake (young grasses have low roughage).
- c) Heavy use of nitrogen and/or potassium fertilizer on pasture.
- d) Low intake energy and/or P and its salt.
- e) Stress due to transport, fasting, feed changes or moved to a different paddock.
- f) Animals are either fat, very thin or in a losing body condition.

#### ***C.2. Owner/manager should adapt the following strategies for prevention***

- a) Avoid grazing on new young grasses until new growth is 8 to 10 inches tall as Mg and roughage is more available in mature grass than in new.
- b) Choose legume or mixed legume pastures that are higher in Mg.
- c) Provide high energy, P & its salt as required, and avoid fasting or feed changes.
- d) Use Mg containing fertilizers on pasture that increases herbage Mg (on certain soil).
- e) Avoid grazing on pastures soon after application of potassium and nitrogen fertilizer that reduces Mg availability to the grass.
- f) Supplement Mg orally as magnesium oxide (MgO) at a rate of 60g/cow/day mixed in 100ml water at least every second day during the 'danger period' (1-month pre-calving to 2 months post calving, especially in dairy cows).
- g) Supplement lactating cows with 0.20% Mg in the diet on a dry-matter (DM) basis.
- h) Use salt mixtures containing 10% MgO as a Mg source with other supplements like molasses to increase its palatability.

- i) Supplement with MgO, magnesium chloride (MgCl<sub>2</sub>), magnesium sulphate (MgSO<sub>4</sub>)/ Epsom salt and use grass tetany block.
- j) Keep rumen with low K & nitrogen (N), and high sodium (Na) for higher Mg absorption.
- k) Manage BCS of the animals that are fat, very thin or in a losing body condition.
- l) Manage or avoid stress due to transport, fasting, sudden feed changes or moved to a different paddock during the danger period.

### **C.3. Management of grass tetany or grass staggers**

- a) If treatment is started 1 or 2 hours after clinical signs develop, the results are usually a quick recovery, but the treatment is not effective if delayed until the coma stage.
- b) Therefore, grass tetany is an emergency, so treatment must be started immediately before turning animal out to graze as per advice of a Registered Veterinarian.
- c) The treatment is IV injection of an approved Mg preparation and a dextrose-based Ca.
- d) Subcutaneous injection of MgSO<sub>4</sub> may provide a high level of blood Mg in 15 minutes.
- e) A subcutaneous injection of Ca and Mg solution followed by a subcutaneous injection of 60-200 mL of 50% MgSO<sub>4</sub> solution can be effective in acute cases where time is critical.
- f) Follow-up MgSO<sub>4</sub> (20-60mL of 50% solution) injection is often needed for a day or two.
- g) Sixty grams of magnesium oxide (MgO) should be fed daily after recovery to ensure that the cow's magnesium requirements are met.

### **D. Mastitis**

- 1) Mastitis is the inflammation of the mammary tissues of one or more quarters caused by microbial invasion into the teat canal and mammary tissues and occurs as a result of physical, chemical, mechanical and/or thermal injury to the mammary gland(s).
- 2) Mastitis is the most common disease in milk producing animals, most common in the dairy cattle and buffaloes, and occasionally in goats, sheep and pigs, and characterized by various degrees of severity- ranging from a mild disease with no gross changes in the milk but an increase in inflammatory cells (somatic cells) in the milk (subclinical mastitis), to a moderate disease with an increase in somatic cells and marked gross changes in the milk associated with the signs of inflammation of the mammary gland(s) including swelling, redness, and painfulness, sometimes associated with systemic signs including fever, depression, "off-feed" and occasionally death (clinical mastitis).
- 3) Mastitis largely reduces milk production, milk quality, milk production potentials, and economic values and productive longevity of the milk producing animals.

**D.1. Owner/manager should be careful about the following risk factors**

- a) Age and parity- animals in higher parity is most likely to be in risk of mastitis ( $\geq 4$  years of age with  $\geq 4$  calving) and multiparous cows are at higher risk than primiparous cows.
- b) Breeds- high milk yielding breeds (e.g., Holstein-Friesian) have a higher risk of mastitis, as that are genetically more vulnerable to mastitis than medium yielders.
- c) Lactation stage and milk yield- animals with high milk production in the early lactation have more risk of mastitis.
- d) Periparturient period- periparturient animals are at a higher risk to acquire mastitis.
- e) Season- mastitis is higher in wet season with hot & humid climate than in dry season.
- f) Udder structure and teat shape- animals having pendular-shaped udder and blind quarters after parturition, large funnel-shaped teats, flat teat or round teat ends have more risk to mastitis than cows with flat-shaped udder and/or pointed teat end.
- g) Previous udder infections- animals having a history of previous udder infections are significantly at higher risk of clinical mastitis.
- h) Periparturient diseases- animals have suffered or are suffering from periparturient disease become more susceptible to udder infection due to lowered immunity.
- i) Herd size- high stocking density, e.g., the herds with  $>10$  cows are at higher risk of mastitis prevalence than in the herds with  $\leq 10$  cows.
- j) Body condition- animals with poor BCS have a higher risk of clinical mastitis.
- k) Leaking or oozing milk from udder- animals with a history of leaking or oozing milk from the udder have a significantly higher risk of clinical mastitis.
- l) Animal, udder and leg hygiene- dirty milk producing animal, and dirty udder and leg of milk producing animals are significantly contributed to the incidence of mastitis.
- m) Milking procedure- milking mastitic animals last, use of equipment and utensils following sterilization/disinfection before and after use, hygienic pre-milking teats preparation, stripping of foremilk before milking, post-milking teat disinfection greatly reduces the risk of mastitis.
- n) Host-nutritional stress and immune system- a NEB for colostrum and milk production during the early lactation caused nutrient deficiencies in trace elements (selenium, iron, copper, zinc, cobalt, chromium), amino acids (lysine, L-histidine), and vitamins (A, C, E,  $\beta$ -carotene, lycopene) leading to immunosuppression resulting in increased susceptibility to mastitis.

- o) Floor condition and bedding- wet, dirty and contaminated floor, no use of disinfection of the maternity area after parturition, and wet and/or thick layer of bedding in the stall significantly increase the risk of mastitis.
- p) Environmental factors- clean, well ventilated and healthy conditions for the milk producing animals can reduce the incidence and severity of mastitis.

***D.2. Owner/manager should adapt the following strategies for prevention***

- a) Maintaining clean, dry and contamination free floor with dry and thin layer of bedding in the stalls, and proper animal, udder and leg hygiene.
- b) Keeping the dairy herd in clean, well ventilated and healthy conditions.
- c) Encouraging animal to feed more during transition & early lactation to avoid NEB.
- d) Maintaining optimum BCS of periparturient animals & avoiding high stocking density.
- e) Running prevention & treatment for peripartum diseases and milk oozing from udder.
- f) Infusion of antibiotics on all quarters of cows one week prior to calving.
- g) Hygienic teat preparation for milking and disinfection of teats pre- and post-milking.
- h) Using equipment and utensils following sterilization/disinfection before and after use, and milking mastitic animals last.
- i) Adopting proper and hygienic hand milking and maintaining milking machines with hygienic teat clusters, if machine milking.
- j) Treatment of all clinical and subclinical mastitis and accurate recording of the disease and culling animals with persistent mastitis records.

***D.3. Management of mastitis***

- a) The first aid of mastitis, once mastitis has been detected involves applying ice cubes in a piece of cloth or ice-cool/cold water spray on the udder surface to minimize the pain and inflammation and should be applied as required.
- b) The milk from infected quarter(s) should be drained out thrice a day and safely disposed of by adding 5% phenol to the milk to ensure hygienic disposal.
- c) There are two options of mastitis treatment- infusion of intramammary antibiotics and administration of systemic antibiotics.
- d) Intramammary antibiotics should be the first-line of treatment for animals with mild uncomplicated mastitis in a single quarter.

- e) Systemic antibiotics should be used when more than one quarter is affected, when udder changes are marked or when the animal is obviously ill.
- f) Combined therapy with both systemic and intramammary antibiotics may increase cure rates but should only be used based on advice of a Registered Veterinarian.
- g) Non-steroidal anti-inflammatory drugs (NSAIDs) reduce pain and swelling in glands in mild to severe cases, and NSAIDs and intramammary antibiotics have better recovery.
- h) However, not all patients will respond to treatment, they should be identified before wasting money for treatment and removing them from the herd (*Staph. aureus* infection has approximately 1% chance of cure).
- i) Antibiotic treatment failure is usually due to insufficient antibiotics being given for too short period of time, infection by antibiotic resistant bacteria or mastitis by virus/fungus.
- j) Treating subclinical mastitis with antibiotics is generally not economical during lactation because of high treatment costs and poor efficacy (e.g., mastitis by *Staph. aureus* or *Strep. agalactiae*).
- k) Animals with clinical mastitis should be kept separate from other animals in a clean dry floor with thick and soft bedding to avoid injury to the glands.
- l) Regular treatment and supportive activities must be continued until recovery.
- m) A Registered Veterinarian should be consulted if needed, no intervention or change /interruption of treatment should be done without concern of the veterinarian.
- n) Animals with subclinical mastitis should be kept separately from other animals and are preferred to cull when they have prolonged subclinical mastitis.

#### **E. Retention of Placenta/Retained Placenta/Retained Fetal Membranes**

- 1) Generally, placenta expels within 2-24 hours after calving in cows, 4-18 hours in buffaloes, 1-12 hours in goats, 2-8 hours in sheep and 1-12 hours in pigs.
- 2) However, if the placenta takes longer time than the highest range of the normal time in the respective species after parturition, this condition is called retention of placenta/retained placenta/retained fetal membranes.

**E.1. Animal owner/farm manager should care about the following risk factors**

- a) Significant risk factors for retained placenta are dystocia, twin births in cows, stillbirth, abortion, endometritis and metabolic disorders like milk fever, pluriparity ( $\geq 3$  parity) and shorter gestation length of animals.
- b) Potential risk factors are farm size, calving season, birth of male calf and breeds.
- c) Pre-parturient vitamin and mineral deficiencies (reduced serum Se, Ca, Mg, Mo and Zn) are associated with a high incidence of retained placenta.
- d) Heat stress increases corticosteroid secretion that reduces plasma concentration of estradiol and thus increases the incidence of retained placenta.

**E.2. Animal owner/farm manager should adapt following steps for prevention**

- a) Good dry period management including correct nutrition with Mg and fat-soluble vitamins, increased DMI, correct BCS, and clean dry stalls for the animals.
- b) Balanced ration and proper management practices during periparturient period, clean, dry and comfortable parturition areas, and proper sanitation during parturition.
- c) Feeding high energy and protein diet to overcome NEB; Ca, P and Se in diet during dry and periparturient period; IM injection of vitamin E (500 IU/cow/day) and vitamin A/ $\beta$ -carotene (600mg/cow/day) to the periparturient animal before parturition.
- d) Prevention of periparturient disorders (NEB, ketosis etc.) and improving immunity.
- e) Antibiotics therapy, hormonal treatment, nutritional management and immunization against infectious diseases.
- f) Administration of oxytocin (50 IU in cow) during the early postpartum period (3-6 hours after parturition) accelerates placental expulsion.
- g) Improvement of animal welfare and hygiene at parturition, reducing stress, infections and risk factors, and using  $\text{PGF}_{2\alpha}$  or oxytocin.
- h) Intramuscular injection of lysozyme dimer (0.01 g/kg bwt), an immune modulator before, during or immediately after expulsion of the fetus.
- i) Animal owner/farm manager should follow the instructions mentioned below:
  - (1) manage the dry period properly.
  - (2) allow balanced ration to the animals.
  - (3) manage correct BCS during the periparturient period.
  - (4) reduce stress near delivery as much as possible.

- (5) supplement trace mineral and fat-soluble vitamins.
- (6) prevent NEB, ketosis and hypocalcemia, and depressed immunity.
- (7) provide antibiotics therapy and hormonal treatment, if necessary.
- (8) maintain good health, hygiene and sanitation at delivery and parturition areas.
- (9) prevent Brucellosis and Epizootic Bovine Abortion by immunization.
- (10) vaccinate to minimize the chance of viral or bacterial abortions.

***E.3. Management of Retention of Placenta/Retained Placenta/Retained Fetal Membranes***

- a) Unfortunately, there are few effective treatment options for retained placenta and many common treatments have no efficacy.
- b) However, leave the animal alone, in a clean place and watch her, and untreated cows expel the membranes in 2-11 days.
- c) Most animals with retained placenta will be fine unless become sick, if so consult a Registered Veterinarian.
- d) Antibiotics should not be used for at least three days from delivery, if the cow is not sick.
- e) However, antibiotics like Penicillin or Oxytetracycline once per day for 3-5 days may decrease bacterial complication resulting from retained placenta.
- f) When systemic signs of illness are present, systemic treatment with antimicrobials and adjunctive therapy are indicated.
- g) Cows with a rectal temperature of 102.5°F to 103°F (or above), depressed and/or dehydrated are likely to require more aggressive treatment by a veterinarian.
- h) Oral/IV fluids & other supportive measures may be indicated if the cow is not eating.
- i) An injection of PGF<sub>2α</sub> can cause uterine contraction that helps to expel the placenta.
- j) However, oxytocin, estradiol, PGF<sub>2α</sub>, and oral Ca preparations have not been shown to hasten expulsion of retained placenta or to prevent complications.
- k) Manual removal and trimming of excess tissue of the retained placenta are not advised and it is potentially harmful and contributes to gross contamination of the genital tract.
- l) Never try to pull the placenta out and it is more likely to create a serious infection.
- m) Antibiotic and other chemical must not be placed into the uterus after parturition.

**F. Uterine Diseases: Metritis, Endometritis, Pyometra, Hydrometra & Mucometra**

- 1) Puerperal metritis could be defined as an animal with an abnormally enlarged uterus and a fetid watery red-brown uterine discharge, associated with signs of systemic illness, such as decreased milk yield, dullness or other signs of toxemia and fever within 21 days after parturition.
- 2) Animals that have no systemic illness, but have an abnormally enlarged uterus and a purulent uterine discharge detectable in the vagina within 21 days postpartum may be classified as clinical metritis.
- 3) Clinical endometritis is characterized by the presence of purulent (> 50% pus) uterine discharge detectable in the vagina 21 days or more after parturition, or mucopurulent (about 50% pus, 50% mucus) discharge detectable in vagina after 26 days postpartum.
- 4) In the absence of clinical endometritis, an animal that can have subclinical endometritis and can be defined by >18% neutrophils in uterine cytology samples collected 21-33 days or >10% neutrophils at 34-47 days postpartum.
- 5) Pyometra is defined as the accumulation of purulent material within the uterine lumen in the presence of a persistent corpus luteum and a closed cervix.
- 6) Hydrometra is characterized by an enlarged uterus due to the accumulation of hypoechogenic fluid without presence of placental, embryonic or fetal structure and develops during prolonged and continuous exposure to progesterone from the persistent corpus luteum, is also referred as pseudopregnancy, and is commonly occurred in dairy goats, rarely in sheep and occasionally in cattle and buffaloes.
- 7) Mucometra is almost similar to the hydrometra with only a characteristic difference and that is the consistency of the fluid accumulated in the uterus with presence of corpus luteum and the fluid is characterized by non-odorous, opaque and thick mucus, and it is like hydrometra, also referred as pseudopregnancy, commonly occurred in dairy goats, rarely in sheep and occasionally in cattle & buffaloes.

***F.1. Animal owner/farm manager should care about the following risk factors diseases***

- a) Dystocia- dystocia is often linked with many postnatal problems in animals like retained placenta and delayed uterine involution, which favor the development of endometritis.
- b) Retained placenta- retained placenta is the main risk factor for uterine infections.

- c) Twinning and dead fetus- twinning in cows and buffaloes and dead fetus in all of the domestic livestock are the risk factors for uterine infections and diseases.
- d) Parturition environment- dirty and contaminated parturition environments are the source organisms that cause uterine infections and diseases.
- e) Nutrition- Poor quality and/or less quantity proteins in the ration cause immune-suppression, which may lead to uterine infections and diseases.
- f) NEB- NEB is often linked with severe and prolonged uterine inflammation and delayed uterine involution, favors the development of many metabolic disorders, especially ketosis that can increase the risk for endometritis, retained placenta and metritis.
- g) Hypocalcemia/milk fever- hypocalcemia is a risk factor for retained placenta that may affect the incidence of metritis and endometritis and the severity of endometritis.
- h) Mastitis- mastitis is a source of contamination within the environment that may favor the development of endometritis and subclinical mastitis can directly and significantly influence the prevalence of subclinical endometritis at postpartum.
- i) Increased levels of serum fatty acid, Hapto and ketone bodies- increased non-esterified fatty acid prepartum ( $\geq 0.6$  mmol/L), increased Hapto in the first week post-partum ( $\geq 0.8$  g/L) and hyperketonemia ( $\geq 1,100$   $\mu$ mol/L) are risk factors for metritis.
- j) Body condition - low BCS at parturition are the risk factors for metritis.
- k) Cyclicity- the onset time of the resumption of ovarian activity itself significantly affects the process of uterine involution resulting in development of endometritis.
- l) Parity- parity of the animals may be a risk factor for endometritis.
- m) Parturition season- parturition occurring between November and April dramatically increased the incidence of uterine infection during the first month postpartum.
- n) Management- potentially significant and higher incidence of uterine infection and diseases are associated with poor management.

***F.2. Animal owner/farm manager should adapt the following steps for prevention***

- a) Basic principle of prevention of uterine diseases is the earlier diagnosis and faster treatment of the diseases for quick returning of the animal to the normal health state.
- b) Allow animals to prevent development of uterine infections using the 3 complementary defensive strategies- avoiding, tolerating and resisting infection with pathogen.
  - (1) Avoidance- limiting the exposure to pathogens and avoiding infected animals.

- (2) Tolerance- limiting the damage caused by the pathogens that includes neutralizing microbial toxins, protecting cells from damage, enhancing tissue repair.
- (3) Resistance- limiting pathogen burden that include inflammation driven by innate immunity and adaptive immunity with aim of killing & eliminating pathogens.
- c) Help animals to prevent the postpartum uterine infections by avoiding trauma to genital tract, reducing stress, and feeding animals properly at periparturient stage.
- d) Pay attention to the hygiene of animals, animal housing and parturition areas, animal comfort, animal management and nutrition, and postpartum health monitoring.
- e) Manage dry animal facilities without overcrowding in the close-up/maternity pen with individual stalls on a bedded pack with adequate feed bunk space per animal.
- f) Reduce changes in housing and grouping in the transition period and reduce stress.
- g) Manage animal comfort in the close-up/maternity pen with good ventilation and air movement to reduce heat stress and improve air quality.
- h) Ensure adequate intake of nutrients with vitamins and minerals to reduce NEB, incidence of hypocalcemia, ketosis and retained placenta and to maintain good BCS.
- i) Manage hypocalcemia with dry animal dietary Ca restriction, dietary acidification using anionic salts and dietary Mg supplementation where appropriate.
- j) Ensure correct nutrition during dry off and normal parturition in hygienic conditions to prevent retention of placenta.
- k) Include 0.3 ppm Se in the prepartum ration and inject Vitamin E at recommended dose during the prepartum to prevent retention of placenta.
- l) Inject 30 IU oxytocin postpartum reducing retention of placenta and endometritis.
- m) Good husbandry practices of transition animal management to enhance general health status and immunity and therefore lower the incidence of retained placenta.
- n) Administer GnRH (Gonadotropin releasing hormone) on Day 14 postpartum that will stimulate cyclicity and help in clearing uterus and bringing faster uterine involution.
- o) Administer controlled released monensin capsule for 95 days at the end of lactation to reduce the incidence of postpartum uterine disorders and to increase BCS at birth.
- p) Monitor the potential problems and take improvement steps to reduce the likelihood of experiencing problems of uterine infections and diseases, which are-
  - (1) Using the genetics of high immune responding bulls with history of easy birth.
  - (2) Practicing good hygiene in all assisted births.

- (3) Disinfecting the equipment used in birth assistance before and after use.
- (4) Avoiding sharing equipment with neighboring farms.
- (5) Keeping animals in a clean and dry shed and
- (6) Removing the placenta immediately after passing.
- (7) Consulting Registered Veterinarian about disease treatment.

### ***F.3. Management of Uterine Diseases***

#### **F.3.1. Metritis and Endometritis**

- a) Therapy for metritis includes systemic antibiotics and fluid (if necessary).
- b) Repeated oxytocin or prostaglandin injections may facilitate uterine evacuation.
- c) Supplementary therapy for tetanus and endotoxemia may be helpful.
- d) However, administration of  $\text{PGF}_{2\alpha}$  is not effective for treatment of clinical or subclinical endometritis, but it is particularly valuable when corpus luteum is present.
- e) Intra-uterine antibiotics are generally considered the most effective treatment for metritis and endometritis (oxytetracycline for 1 to 3 days).
- f) Intrauterine antibiotics treatment will improve reproductive performance, but the treatment takes time to work (at least four weeks before mating starts).
- g) In the treatment of uterine diseases, different intrauterine therapies like antiseptics, antibiotics and immune modulators are used to eliminate bacterial infection, stimulate the normal uterine defense mechanism, or to increase the blood flow to the uterus.
- h) The most used intrauterine therapy is the infusion of iodine solution in water or saline.
- i) Non-steroidal anti-inflammatory drugs are used in clinical metritis and endometritis by administering IM twice a day for 3 days as anti-inflammatory, antipyretic and analgesic.

#### **F.3.2. Pyometra, Hydrometra and Mucometra**

- a) The treatments of pyometra, hydrometra and mucometra are more or less similar.
- b) The treatment of these diseases/conditions involves emptying of the uterus usually by 1 or 2 administrations of  $\text{PGF}_{2\alpha}$  or its analogs at normal luteolytic doses.
- c) Expulsion of exudate and bacterial clearance of the uterus follows in ~80% of treated cases and the treatment may need to be repeated in ~20% of cases.
- d) However, no intrauterine therapy is suggested in combination with prostaglandin.

### **G. Postpartum Dysgalactia Syndrome (PDS) in Sows**

- 1) Postpartum dysgalactia syndrome has been characterized by rectal temperature of  $>39.5^{\circ}\text{C}$  within 12-24 hours postpartum and detectable inflammation of one or several mammary glands with redness, edema, palpable hardening, skin congestion; reduced appetite, or a combination of these signs and is a noninfectious but rarely found in outdoor swine production facilities.
- 2) Postpartum dysgalactia syndrome is also called as mastitis-metritis-agalactia (MMA), periparturient hypogalactia syndrome,agalactia toxemia,agalactia complex,agalactia postpartum, lactation failure or puerperal septicemia.
- 3) Behavior and health of the Piglets of PDS affected sows may also be affected with diarrhea, crushing (ignoring piglets by the sow), stunted growth, inanition (fatigue from lack of food), poor growth, and in severe cases, piglet mortality is bigger for starvation.

#### ***G.1. Animal owner/farm manager should be careful about the following risk factors***

- a) Farrowing induction.
- b) Over conditioned sow at farrowing.
- c) Sows dirty prior to farrowing.
- d) Poor immune defense of the sow.
- e) Feeding sows *ad libitum* during lactation.
- f) Low fiber content in the transition diets.
- g) Poor quality or inadequate water supply.
- h) Hypocalcemia and ketosis (although post-farrowing hypocalcemia is not significant).
- i) Inadequate farrowing house temperature and prolonged duration of farrowing.
- j) Contaminated farrowing pens.
- k) Concurrent disease like mastitis, metritis,agalactia (MMA).
- l) Mycotoxicosis (aflatoxins, zearalenone).
- m) Stressful management and housing of sow.

#### ***G.2. Animal owner/farm manager should adapt the following strategies for prevention***

- a) Keep the sow on a laxative diet at the farrowing time.
- b) Provide transition diets with higher fiber content.
- c) Supplement with amino acids (arginine, cysteine, L-glutamine and leucine in feed).

- d) Control feeding sows shortly after farrowing.
- e) Maintain a regular exercise schedule.
- f) Scrub the farrowing pens to avoid the build-up of infection.
- g) Save piglets of the affected sows by artificial rearing with cow's milk & 5% dried milk.
- h) Provide early treatment with antibiotics to avoid loss of milk.

### **G.3. Management of postpartum dysgalactia syndrome (PDS) in sows**

- a) Most clinical cases can be treated effectively with NSAIDs, hormones, and/or antibiotics.
- b) Treatment should begin when body temperature is 39.4°C, 12-18 hours post farrowing.
- c) Oxytocin (5-10 IU/sow) is occasionally effective in reestablishing lactation, if given IM 4 or 5 times a day at 2- to 3-hour intervals.
- d) Moreover, antibiotics should only be administered if the treatment with NSAIDs and Oxytocin was not successful.
- e) Feed medicated with sulphonamide at 15 mg/kg body weight or tetracyclines from day 112 of gestation to day 1 postpartum, reduces the incidence of PDS markedly.
- f) Because sows are often culled at weaning, it is important to consider withdrawal times before allowing antimicrobial treatment.
- g) Moreover, if antimicrobials are used long term, a dependence on them for puerperal fevers, acute mastitis, or neonatal diarrhea can develop rapidly and lead to multi-resistant bacterial infections.
- h) Cross-fostering the piglets from affected to healthy sows, as long as the health status of the litters is equivalent, is the most effective strategy in management of PDS.

#### **Notes:**

1. Dystocia, abortion, vaginal and uterine prolapse in cattle and buffalo; abortion, vaginal prolapse and hydro-allantois in goats and sheep; and vaginal prolapse, in few cases, in sheep during the periparturient period are found in Bangladesh.
2. As all of these diseases/conditions are obstetrical and gynecological cases and the preventive measures against them are poorly effective, so self-initiatives of the animal owner/farm manager without the intervention of a veterinarian will be almost fruitless and sometimes devastating.
3. Therefore, these problems of the domestic animals could be overcome only by the direct intervention of a Registered Veterinarian.

### **10.1.3. Lactation Management**

- a) As Bangladesh does not have any dairy breed of the goat and sheep, the pig could not be used in milk production and a few buffaloes are used for milk production, the lactation management has been discussed giving emphasis on dairy cows and those cows that are used for milk production.
- b) There are main 3 stages in the lactation cycle of the dairy cows:
  - 1) Early lactation (14-100 days)
  - 2) Mid lactation (101 to 200 days)
  - 3) Late lactation (201-305 days)
- c) At calving, a cow's appetite is only about 50-70% at peak intake due to the growing calf taking space in the abdomen resulting in reduced rumen volume, and density and size of rumen papillae, although their appetite gradually increases to consume nutrients.
- d) Body weight loss during early lactation occurs due to increased milk yield more rapidly than dry matter intake resulting in NEB, so feed intake is the key in maintaining high milk production during the early lactation.
- e) Feed intake by the dairy cattle and buffaloes is influenced by many factors including level of production, forage quantity and quality, feed digestibility, feed processing, feeding frequency, consistency of ration ingredients etc.

#### **10.1.3.1. Nutrition during Lactation**

- a) Cows and buffaloes should be encouraged to maximize their intake during the early lactation to prevent body weight loss and NEB.
- b) Dairy feed should be balanced and palatable to increase DMI and to maintain nutrition.
- c) For maximum production, dairy rations should have effective fiber, non-structural carbohydrates, ruminal undegradable and soluble protein to maximize microbial yield.
- d) Adequate good quality forage should be supplied with increased feeding frequency.
- e) Dairy animals should be fed protein and energy together for higher milk fat percentage.
- f) If forage and grain are being fed separately, forages should be fed first in the morning followed by a portion of the grain mixture.
- g) Body condition score at calving, disease status and climatic stress should be managed.
- h) By the beginning of mid lactation, cows and buffaloes will achieve peak production at 8-10 weeks post calving and hence, the peak DMI at 4% of body weight should be managed with no more weight losses at that period.

- i) As the cows use body reserve for about 12 weeks post calving to provide energy for peak milk production in addition to that they consumed, so they should be encouraged to feed more energy up to 12 weeks of calving (starting of the mid lactation).
- j) Care should be taken for dairy cows and buffaloes about the high DMI, digestibility, palatability, easy access to rations, and optimal rumination time for more production.
- k) Although energy required for milk production is less during the late lactation as production is declining, so cows should be fed high energy for pregnancy maintenance and to build up BCS for the next lactation as reserve, if become pregnant.
- l) Optimal BCS should be maintained during the first month of calving and during the first 2 months of lactation for maintaining peak production.
- m) Lower BCS cows and fat cows during the first month of calving and during the first 2 months of lactation may be susceptible to metabolic/reproductive disorders, or mastitis.
- n) Accurate body weight of lactating cows should be recorded for balancing rations and evaluating changes in body tissue reserve and BCS.
- o) If cows feed insufficient nutrients to maintain milk yield, they will dry off prematurely.
- p) Bovine somatotropin (bST), also known as bovine growth hormone, can be used to increase the yield and efficiency of milk production in dairy cows by preventing mammary cell death, and milk secretion increases within a day and is maximized within a week after bST injection, but this is not presently practiced in Bangladesh.
- q) Milk yield increases 8-10% on long days due to 6-7% increased intake, so bright light for 16 hours and darkness for 8 hours each day should be provided for more intake.
- r) Additional 1 kg dry matter should be fed for every 2-2.4 kg of milk yield and 1 extra kg/day at the peak production can produce an extra 200 kg milk/cow over the lactation.
- s) Feeding operations, watering, exercise, milking, etc. must be carried out in the same manner and at the same time daily, any deviation of these may decrease milk yield.
- t) Herds/cows should be visited daily once in the morning and once in the evening to observe the heat, disease, injuries, quantity and quality of forages, sanitation, care of calves, maintenance of equipment etc. to help in rectification of difficulties, if needed.
- u) Important notes on feeding and nutrition of dairy cows:
  - 1) Straws and hay can be replaced by greens @ 4-5 kg greens for 1 kg straw/hay.
  - 2) Addition of sodium bicarbonate @ 15-50 gm/day to total daily concentrate feeding.
  - 3) Fried and ground soybean @ 20-25% can be added proportionately reducing grains.

- 4) Protein content in the ration should be reduced during hot weather.
- 5) After calving, an additional 1.5% mineral mixture should be added daily to the feed.
- 6) Molasses/low quality jaggery can be added @ 7-10% in feed to supplement energy.
- 7) More elements in concentrate, more essential amino acids, can help in muscle building.
- 8) Nutrient guidelines for lactating dairy cows have been presented in the Appendix 27.

#### **10.1.3.2. Reproductive Events in Dairy Cows during Lactation**

- a) Total 305 days of lactation period, 45-60 days dry off, 60-85 days open period and calving almost at yearly interval are desirable for profitable dairy cow/farm operation.
- b) Good nutrition in the last 50-60 days pre-calving should be provided to the cows as that has a profound effect on cyclicity after calving.
- c) Good BCS should be maintained, as it is correlated to several reproductive events (days open, services per conception, milk production, calving interval, weaning weight etc.).
- d) As lactational anestrus can occur for utilizing more body reserves in the early lactation, the cows should be encouraged to more DMI in the early lactation to prevent NEB.
- e) As the suckling stimulus has a negative effect on cyclicity of the dam during the lactation period, so the calf should be weaned as early as possible.
- f) Care should be taken to prevent disease conditions during uterine involution, which can influence cyclicity of the lactating cows.
- g) If the lactating cows don't conceive between 60 to 85 days postpartum, a Registered Veterinarian should be consulted and his/her instruction should be followed.
- h) Presence of teaser bull during postpartum results in causing cows to cycle earlier.
- i) Estrus synchronization could be performed, as it can bring cows into heat provided all other management practices such as nutrition and BCS are optimum.
- j) Important notes on reproduction and breeding program should be followed:
  - 1) Maintain accurate records including heat dates, breeding dates, sires used, calving dates, calving difficulties, retained placenta, abnormal vaginal discharges, disease conditions, irregular estrus cycles, repeat breeding and treatments given.
  - 2) Examine cows around 30-40 days postpartum to ascertain uterine health, and re-examine cows that don't come into heat at 50-60 days postpartum, and treat the cows, if necessary.
  - 3) Inseminate all cows with proven bulls' semen on first heat by 40-60 days of calving.

- 4) Inseminate cows after 6-8 hours of standing heat and re-inseminate after 6-8 hours.
- 5) Examine all cows and heifers for pregnancy at 45 to 60 days after last insemination.
- 6) Examine cows and heifers that conceived after 2nd or 3rd service, if returned to heat.
- 7) Clinically examine cows and heifers that abort habitually.
- 8) Assess nutrition program and production records, as milk yield and composition are influenced by amount of energy, and amount and type of protein and amino acids.

#### **10.1.3.3. Milking Management**

- a) Primiparous cows that do not have mastitis should be milked first to prevent the spread of clinical mastitis among the first-lactation cows.
- b) Then the multiparous cows that are free from mastitis should be milked first preferably using separate milking units/utensils to prevent spread of subclinical mastitis among the multiparous cows.
- c) Then the cows having subclinical mastitis should be milked before the cows with clinical mastitis and the cows having clinical mastitis should be milked at last irrespective of their parity preferably by a separate person using separate milking unit/utensils.
- d) The milking units/utensils using in milking must be properly cleaned and disinfected, if possible dried before and after use.
- e) Milking parlor/pen/area must be properly cleaned and disinfected, if possible dried before and after milking, but in backyard system, the milking area should be at least cleaned, if not possible disinfection.
- f) Preparation for milking should include-
  - 1) Clean and sanitize the milker's hands and dress before starting the milking process,
  - 2) Clean and wash teats up to the base of the udder with an effective and approved antiseptic solution by spaying or sprinkling for 30 seconds,
  - 3) Observe the foremilk by stripping milk into a strip cup (not under the cow),
  - 4) Dry the teats and udder by wiping with individual towels.
  - 5) Attach the milking unit or hand milking, and
  - 6) Disinfect each teat individually up to the base of the teat with an effective and approved disinfectant by dipping/spraying, if possible, using teat dip/spray kit (10 ml of solution for dipping and 15 ml for spraying per teat).

- g) The milking stimulus is very important for proper 'milk let down', so the milker should-
  - 1) Wash and massage the cow's teats and udder, preferably with lukewarm water containing a sanitizing solution immediately before milking, and then dry the teats and udder thoroughly with an individual towel, which provides additional stimulus for milk let down and prevents spread of udder infection.
  - 2) However, this procedure can be used in hand milking where the previously mentioned washing and dipping/spaying of udder and teats could not be followed, especially in smallholders' dairy farming and in the backyard system.
  - 3) Allow calf to suckle immediately before milking to stimulate milk let down, if done so, the teats and udder must be washed again with a sanitizing solution followed by wiping to dry with individual towels.
  - 4) However, this procedure could be used in hand milking where the calves are not weaned, especially in smallholders' dairy farming and in the backyard system.
  - 5) feed milking animals 1/3 or 1/2 of the day's concentrate after cleaning udder.
  - 6) establish a milking routine, which will allow to milk the animals daily at a particular time of a day (e.g., daily at 6 am and at 6 pm) that will stimulate to let down of milk at the time of milking due to the conditioned reflex of time.
- h) Cows are milked 2 or 3 times a day preferably at 5am-11pm-5pm or 6am-12pm-6pm.
- i) Three times milking per day will yield 25% more milk, especially in the high yielders.
- j) Frequency of milking in other livestock depends on their milk production.

#### **10.1.3.4. Other Management during Lactation**

- a) The milking animal should be allowed constant access to clean drinking water and receive the required quantity of balanced ration and mineral mixture daily.
- b) Salt and mineral supplements should be given to the cows to maintain the lactation.
- c) Never frighten or excite the milking animals and avoid all types stress.
- d) Exercising the confined lactating cows will prevent possible lameness due to stiffness in their limbs and overgrown hooves.
- e) Grooming keeps coat of animals clean, makes hair glossy, stimulates circulation, helps in clean milk production and makes them docile.
- f) All cows irrespective of breed, class, stage of lactation should be treated kindly.
- g) Any type of cruelty, abusing, kicking and making them move fast by beating should never be practiced and such cruelty to animals spoils their temperament, which will be difficult to eradicate, resulting in reduced milk yield and altered milk composition.

- h) Cow develops a habit of kicking either due to improper treatments or because she was not trained well in heifer stage prior to calving, so heifers should be trained on time.
- i) But, some cows with kicking habit respond to kind and patience handling, if it is difficult to manage, then a milkman's rope or kicking trap should be used during milking.
- j) Feeding proper ration with required ingredients, optimal care, combating stress, loose housing/exercising the confined cows and correct animal welfare etc. will help the cows to come into heat within 60 days of calving and improve dairy cow productivity in term of milk production and its composition, and use of AI technology can improve the genetic characteristics of the upcoming offspring.

#### **10.1.4. Dry-off Management**

- a) The pregnant cow in the last trimester of gestation should be allowed to abrupt dry off and continued for average 2 months (45-60 days) in cows that would be optimum to-
  - 1) provide rest to the mammary glands for regeneration of the milk producing tissues,
  - 2) build up reserves of nutrients in the body, i.e., for improving BCS,
  - 3) maintain good level of milk production in the subsequent lactation,
  - 4) divert nutrition for development of fetus instead of milk production, and
  - 5) prevent nutritional disorders like milk fever, ketosis etc.
- b) Abrupt dry off is generally recommended for cattle, buffaloes, sheep and goats.
- c) Lactating pregnant goats/sheep should be dried for 35-56 days before kidding/lambing., but pigs don't require drying off, as the sows come into heat 4-8 days of piglet weaning.
- d) As the maximum fetal growth takes place during the last few weeks of gestation (last 6-8 weeks), the pregnant cow should be increased DMI during that period of dry off.
- e) Dry cows should be allowed for limited exercise and a comfortable house (100-120 sq.ft. area/cow in loose housing) with clean, soft and optimum bedding.
- f) Dry cows should be given plenty of greens and extra allowance of concentrate and the ration must be palatable, nutritious, balanced and laxative in nature.
- g) Maintaining at or increasing to optimal BCS (2.5-3.0) during the dry period should be expected to ensure adequate body reserves for fetal development and early lactation.

#### **Note:**

Lactating and dry off animals should be dewormed and vaccinated against the infective diseases prevalent in Bangladesh by trained personnel as per advice and under the supervision of a Registered Veterinarian (as Appendix 30, 31, 32 and 34).

## **CHAPTER XI**

### **NEONATE AND INFANT MANAGEMENT OF LIVESTOCK**

#### **11.1. Care of Newborn**

- a) Newborn must be born under good hygienic condition.
- b) Generally, the dam chooses to clean its newborn baby, if not, then the farmer should clear the mucus and mucous membrane on the nostrils, face and other parts of body using a clean dry towel.
- c) Body of the newborn must be cleaned immediately after birth to avoid contamination.
- d) Newborn must respire after clearing the mucus and other filths from its nostrils.
- e) If the newborn does not start respiration after removing mucus and other filths from its nostrils, it should be shaken gently by holding its head down to clear airways.
- f) If the newborn does not start respiration even after shaking it by holding head down, the resuscitation is required to start respiration.
- g) The resuscitation should follow the steps below:
  - 1) immediately dry the newborn,
  - 2) warm the newborn by placing near a radiant heat source or by wrapping it with towel or blanket, especially when the rectal temperature is found 97<sup>0</sup>F,
  - 3) keep the head of the newborn in a “sniffing” position to open the airway,
  - 4) clean mucus from the nose and mouth of the newborn to breathe normally,
  - 5) clear the airway with a bulb syringe or suction catheter,
  - 6) insert a straw into its nose to stimulate sneezing and breathing and
  - 7) stimulate respiration by pressing the chest and using other means and medicines.
- h) The navel cord should be disinfected with 7% iodine solution immediately after birth.
- i) The naval cord should be cut 1” below from the navel with a sterilized blade or scissors and be sanitized the navel and cord with Tincture iodine or with a suitable antiseptic.
- j) When the newborn becomes and behaves normal, and stands up from the ground, then the newborn should be allowed to suckle its mother within 20 min of birth.
- k) The newborn should be examined after birth for atresia ani and other malformations, if found any, immediate veterinary support must be provided.

- l) Limbs, eyes, nose, ears, teeth and gums, umbilical cord and other parts of the body should be checked for any abnormality.
- m) But the newborn should not be handled too frequently immediately after birth and let the dams lick and recognize the infant(s) properly.
- n) Needle teeth of piglets should be clipped immediately after birth, but should not be crushed the teeth or cut the gums.
- o) At the same time, tails can be docked leaving a stub on the tail about 1/4-inch long, because the day-old kids, lambs and piglets are the best suited for tail-docking.
- p) Ear-notching of piglets for identification should be done in case of commercial herds.
- q) Castration of male kids, lambs and piglets should be done at day-old for easy doing.
- r) The newborn(s) should always be kept with its/their mother during the first week in a separate pen/stall with soft bedding allowing more floor space than that said earlier.
- s) Defecation and urination of the newborn should be under follow up for absence or for any abnormality of the feces and/or urine.

### **11.2. Colostrum Feeding to the Newborn**

- a) The first milk secreted from the dam immediately after parturition is the colostrum. Feeding of colostrum to the newborn is mandatory for gaining its maternal immunity and to activate the digestive system.
- b) Colostrum should be fed to a calf approximately 2 liters or the amount on its 10% body weight within 4-6 hours of birth.
- c) Ideally, the colostrum feeding should be started to a calf within 30 minutes of birth and ensured about 4 liters of colostrum intake within 12 hours.
- d) Colostrum IgG level must be more than 25g/L and acceptable level is 50g/L.
- e) Colostrum should be given to kids and lambs at the rate of 100 ml per kg live weight.
- f) It should be fed to all newborns for at least 3 days (72 hours).
- g) Colostrum can be refrigerated, if refrigerated, thaw it in warm water before feeding.
- h) The newborn can be fed colostrum by bottle feeding or by suckling mother.

### **11.3. Milk Feeding to the Newborn**

- a) The animal should be milked after parturition and the excess amount of colostrum should be refrigerated for further feeding of the newborn.
- b) Milk feeding of the newborn must start immediately after the colostrum period, although it takes 3-5 days normally to convert colostrum into milk in dam.
- c) During the first few weeks, milk should be fed to newborns at least 8-12 times a day.
- d) Newborn should feed milk/milk replacer at 10% of its bwt/day for first 3 weeks of age.
- e) The newborn can be fed milk by bottle feeding or by suckling mother.
- f) The farmer should feed the newborn by the method which is applicable for his newborn, generally high yielder animal's newborn is fed by bottle.

### **11.4. Newborn Rearing**

- a) Permanent identification should be provided for each newborn rather with an ear tag.
- b) The newborns must always be provided with adequate clean drinking water.
- c) The newborn should have separate pens and be constructed with good natural ventilation against heat stress and protection from any cold weather and predator.
- d) A clean, dry and healthy spaces should be provided to newborns for their easy living.
- e) The calves can be transferred to the individual or grouped pens after 3-4 weeks of age.
- f) When age advances, calves should be housed in increasingly larger groups.
- g) But, the body weight difference among the group mates of calves should not be >50 kg up to 6 months of age and not >90 kg after that period.
- h) During the liquid feeding phase, if calves are housed in groups, mob feeders should be used, which is an efficient method of calf rearing.
- i) Newborns should be kept indoor for first 3 weeks of age and not be allowed go outside.
- j) The newborn should be kept separated from other calves and from mature animals to minimize contamination and to prevent pathogens that cause scours.
- k) The newborn pens should be sanitized regularly to reduce microbial load.
- l) Dry straw bedding is preferable for newborns and that should not be allowed to be wet for a long time.
- m) Bedding should be replaced daily and dried the floor, if possible, be disinfected.

- n) Newborns should consume milk at 15% of their bwt/day after 3 weeks of age.
- o) Concentrates should be introduced to calves at 3 weeks of age and high-quality hay from 5-8 weeks of age to aid in rumen development and prepare them to be weaned.
- p) Feeding kits and staff's hand should be washed daily amid caring calves and adults.
- q) After weaning, calves should be housed in small groups of 10 or fewer until they have successfully made the transition from liquid feed to dry feed.

### **11.5. Health Management of Newborn**

- a) Above 10% of calf mortality is not acceptable, although about 5 to 25% mortality is reported for replacement animals in dairy farms.
- b) However, the highest morbidity and mortality are seen in calves before weaning.
- c) Newborn's environment is an important factor that influences its health and immunity.
- d) The newborns are also highly susceptible to stress leading to illness.
- e) Hence, the most significant causes of pre-weaning death of newborns are digestive and respiratory infective diseases.
- f) These disorders can be controlled by well-designed health management program including care and housing of the dam during the periparturient period, the calving process, feeding of adequate quantities of high-quality colostrum immediately after birth, and the application of proper preventive measures including sound nutritional programs for the newborns.
- g) The newborns should be fed according to their digestive capability, because acidosis and over-eating diarrhea may occur in liquid feeding phase.
- h) If this form of diarrhea occurs in newborns, DMI should be decreased in the liquid diet until the consistency of the feces returns to normal and subsequently, electrolyte and antibiotics should be administered on recommendation of a Registered Veterinarian.
- i) Newborns should be under the feed added with coccidiostats and regular deworming.
- j) Effective insect repellent should regularly be sprayed in the newborns' pens to save them from the vector borne diseases.
- k) Appropriate deworming and vaccination programs for the newborns should be carried out against the prevalent diseases in Bangladesh (like Appendix 30, 31, 32 and 34) as per advice of a Registered Veterinarian.

## 11.6. Weaning Management

- a) Weaning is the withdrawal of access to milk and this process gradually accustoms the young to accepting an adult diet, management of the situations that occurred after weaning of a young from its mother is the weaning management.
- b) Weaning of a young from its mother can be done as natural weaning or by early weaning before natural weaning.
- c) The early weaning is necessary to achieve better reproductive performances, thereby increasing the number of offspring during the reproductive phase of dams.
- d) Early weaning usually causes multiple physiological stresses to progeny and dams and that should be minimized successfully using recommended means and procedures discussed later on in the following sections.

### 11.6.1. Cattle and Buffalo

- a) According to the age of the calves, the weaning in cattle and buffalo can be practiced as 'early weaning' and 'natural weaning' or 'late weaning'.
- b) In the backyard and smallholders' farms, natural or late weaning is practiced in cattle and buffalo and early weaning is practiced in commercial farms of cattle and buffalo.
- c) Natural or late weaning is the weaning of a calf after development of its rumen, when the weaning calf become able to meet its nutrition from the solid feed and is allowed to suckle the dam just for letdown of milk during the whole lactation.
- d) The age of natural or late weaning in cattle is 8-10 months and 9-11 months in buffalo.
- e) Early weaning is the weaning of a young from its mother before its natural weaning.
- f) There are 3 types of early weaning as follows:
  - 1) Weaning at Birth- separation of a calf from the cow immediately after its birth-
    - (a) when the weaning calves are fed on colostrum either of their own dam or other contemporary dams for initial 5 days through bottle or pail feeding method,
    - (b) then, the weaning calves are managed by feeding milk substitute/milk replacer (Appendix 29) till they become able to feed and digest solid feed like roughage,
    - (c) they are allowed to practice hay and concentrate feeding after 90 days.
  - 2) Weaning after Birth- separation of calves from the mother a few days/months after birth before development of their rumen, generally at 30, 45, 60, 75 days after birth-

- (a) when the weaning calves are managed by feeding milk, milk substitute or milk replacer till they become able to feed and digest solid feed like roughage,
  - (b) they are allowed to practice hay and concentrate feeding after 90 days.
- 3) Weaning at Development of Rumen- separation of calves from the mother after 4 months of age when the rumen development is complete (requires 3-4 months)-
- (a) when calves can survive on concentrate and fodder resources, but they are not supplied any milk or its substitute,
  - (b) if calves become failure to develop their rumen, their growth can be inhibited and put themselves at greater risk of illness due to nutritional stress.
- g) It is recommended for early weaning of calves at 100-120 kg body weight for cattle and 120-150 kg for buffalo depending on availability of feed and their body conditions.
  - h) Early weaning causes letdown issues and drop in milk production in dams, health and welfare issues in calves, and mental issues between weaning calves and their mothers.
  - i) Physiological stresses occurring both in calves and cows due to early weaning are expressed as bawling and off feeding or less feeding leading to less milk production by the cow and less weight gain and immunosuppression in calves.
  - j) But the calves and cows begin to forget about each other between 7 and 14 days after the calves and cows are separated.
  - k) Letdown problems in cows and post-weaning feed adjustment and immunosuppression of calves resulting in disease occurrence in calves are the major issues of early weaning.
  - l) There are several methods for establishing early weaning in cattle and buffalo farms, of those that can be practiced are:
    - 1) Temporary Weaning- calves are separated from the mother-
      - (a) for a particular period of time, usually for 48 hours before breeding of the dam to enhance the reproductive hormone surge for increasing reproductive efficiency,
      - (b) after that period suckling is again allowed to calves as per the normal practice.
    - 2) Complete Weaning- the calves are completely separated from their mother-
      - (a) for the entire lactating period,
      - (b) the calves or their mothers are shifted to separate pastures/pen/farm and they can't see each other unless calves are independent of their feeding and nutrition.

- 3) Fence Line Weaning- both the calf and the cow are separated-
  - (a) by a physical barrier through which they can see each other to avoid social stress,
  - (b) part time suckling may be allowed just for the letdown while milking.
- 4) Weaning using Nose-plate- nose plate is a device that is attached to the nose of the calf in such a manner that the calf cannot suckle but intake solid feed and that allows-
  - (a) the calf for transitioning to a fully solid diet while the calf is still with the dam,
  - (b) the calf is allowed with the mother for maintaining the social bonding.
- m) As per the management facilities, the farm manager should decide what type of weaning and what type of weaning method to be applied to his farm from the above.
- n) After weaning, floor space should be 20-25 sq. ft./calf from 2-4 months of age in group and 25-30 sq. ft./calf from 4-8 months individually depending on the body weight.
- o) The farm manager should have plan to minimize the stresses on calves and mothers.
- p) Recommended strategies to reduce weaning stresses on calves and on dams are follows:
  - 1) Allowing previously practiced solid food (hay and concentrate) after weaning may result in a gradual replacement of milk with solid food.
  - 2) Allowing “creep feeding” or “creep grazing” in which the calf has access to feed or pasture respectively that stimulates its rumen development, to eat solid food and thus reduce its nutritional and social dependence on the cow.
  - 3) Allowing calves to access to the weaning area (pen, trap, or pasture) for a few weeks prior to weaning that can minimize environmental stress.
  - 4) Moving the cows to a new location, but not moving the calves.
  - 5) Allowing fence line contact between calf and dam for 4 to 7 days following weaning.
  - 6) Placing feed bunks, hay, and water troughs along the fence to minimize perimeter walking and increase encounter with feed and water when weaning in dry lot/ corral.
  - 7) Placing large water troughs inside of pen and letting water troughs overflow slightly that may attract calves to water and help them to drink from live water sources.
  - 8) Avoiding unnecessary stress by castrating, vaccinating, dehorning or branding calves immediately prior to weaning.

### **11.6.2. Goat and Sheep**

- a) Gradual weaning is important, if kids/lambs are weaned earlier than 70 days of age that are much more likely to have weaning shock.
- b) Does/ewes reach the peak milk production 3 to 4 weeks after parturition, then start to decline and when milk production drops, the kid/lamb needs another feed source to get all the nutrients required for body maintenance and growth.
- c) Weaning could take place by 12 weeks from kidding/lambing or sooner, if the season is poor for grassing that will help the does/ewes recover to back into the next cycle, but 60 days is a common weaning age, if does/ewes are going to pasture with kids/lambs.
- d) As at 4 months of age, the rumen of a goat/sheep is fully developed, the kid/lamb should be weaned after that time when they can consume a feed including roughages.
- e) Different weaning age in goats/sheep depending on locations and situations are follows:
  - 1) 14 days to 4 months of age (natural weaning age),
  - 2) production effective early weaning has been practiced at 14 days in sheep,
  - 3) kids have been weaned early successfully at 28 days,
  - 4) traditionally weaning before 90 days of age,
  - 5) 60 days is most widely used.
- f) The recommended ways and means for reducing weaning stresses on the kid/lamb and on the doe/ewe are as follows:
  - 1) Pregnant ewes should receive adequate nutrients to produce healthy lambs.
  - 2) During first 12 hours of birth, kids/lambs must be fed colostrum to boost immunity.
  - 3) Lambs/kids must be vaccinated against certain diseases to boost immunity for fighting against the stress during weaning.
  - 4) Creep feeding should be practiced to allow feed supplement to nursing kids/lambs.
  - 5) Kids and lambs should become familiar with a new pasture and high-quality hay must be ready before weaning that should be provided to the weaning kids/lambs.
  - 6) A good working facility is necessary to separate young and dam and that should be handled slowly and gently to minimize stress.
  - 7) One week before and 2 days post-weaning, ewes/does should be fed low quality forages avoiding concentrate to reduce milk yield and prevent diseases like mastitis.
- g) After weaning, the floor space should be 6-10 sq. ft/kid or lamb depending on the breeds and individual body weight.

- h) Forage, grains, protein, minerals, vitamins and water should be given to weaning kids/lambs.
- i) Weaned lambs/kids must remain on the existing pasture to reduce stress and the forage must be at a taller grazing height to reduce parasitism, if they are weaned in pasture.
- j) Dehorning, docking, castration, hoof trimming and vaccination during the weaning or immediately before weaning should be avoided that may add more stress to the animal.

### 11.6.3. Pig

- a) Natural weaning at 3-5 weeks and the early weaning can be at 10-21 days of age in pigs.
- b) The increase in feed intake fulfilling the nutritional demands during the early weaning of piglets and reduce weaning stresses could be done by following ways and means:
  - 1) Feeding an appropriate amount of colostrum starting from immediately after birth for a recommended period ensures piglets to be protected by maternal antibodies.
  - 2) Offering highly digestible diet and starting good levels of feed intake and nutrition.
  - 3) Providing ration with organic acids to lower gastric pH, promote digestion, increase gut and pancreas enzyme secretion, and to improve gut wall morphology.
  - 4) Providing sufficient feeder and waterer space for easy access to feed and water.
  - 5) Adding a small amount of acid to the water can help in water palatability and uptake, and allowing to drink fresh, clean water *ad libitum* at the first few days will certainly reduce overall stress.
  - 6) Adding citric acid to drinking water greatly reduces scouring and enhances feed intake and growth rates to reduce variability in growth rates, additionally a blend of soluble plasma and lactose can be added to water.
  - 7) Providing a recommended amount of highly digestible crude protein in the ration from the first 2 weeks after weaning to maximize growth.
  - 8) Maintaining a comfortable temperature in the nest, especially for the piglet's ventral area until it starts to ingest enough to produce its own body heat.
  - 9) Providing 24 hours light a day during the first and second days after weaning helps increase piglet feed intake.
  - 10) Using antibiotics at growth promoting levels, zinc oxide and copper sulfate at pharmacological doses & animal plasma improve post-weaning feed intake and growth.
  - 11) Making an arrangement of an eating area next to the lying area, where the piglets can easily find the feed supply.
  - 12) Providing toys to enrich the environment to prevent boredom, although that can lead to abnormal behaviors such as tail biting.

13) However, 3 feeds and feeding for the weaned piglets are suggested as follows:

(a) Mat Feeding:

- (1) Piglets start by investigating the new pen floor after separated from the dam, so scattering half a pound of starter pellets on the mat placing it near the feeder 3 times daily for 2 to 3 days helps them find and ingest the feed that enhance appetite, leading to understanding the feeds in the feeders.
- (2) This is the most cost-effective way to start feeding and increase feed intake.

(b) Milk Replacers:

- (1) Weaned pigs easily consume a warm liquid milk replacer.
- (2) Feeding a milk replacer 3 to 4 days can easily double DMI than a pellet feed.
- (3) Weaned piglets should be reared on milk replacer in combination with a high-quality starter diet/milk pellets to be accustomed with the solid feed.
- (4) Milk replacers are best for low-weight and orphan pigs.

(c) Gruel Feeding:

- (1) Warm gruel with water/liquid milk co-product at 50:50 can be fed to weaned piglets during the first 2-3 days post-weaning that prevents starvation and dehydration.
- (2) Thickened gruel (70:30), and in combination of solid feed can be offered.
- (3) However, a soup of water or a liquid dairy product and dry feed can dramatically increase (up to 300%) DMI during the first week post-weaning.

c) However, the piglets require 2.25-3.0 sq. ft./head after weaning depending on the breeds and individual body weight for their productive performance.

**Note:**

Weaning young animals should be dewormed and vaccinated against the infective diseases prevalent in Bangladesh (like Appendix 31, 32, 33 and 35) by trained personnel as per advice and under the supervision of a Registered Veterinarian.

## **CHAPTER XII**

### **YOUNG STOCK MANAGEMENT OF LIVESTOCK**

#### **12.1. Young Stock Management of Livestock**

##### **12.1.1. Cattle and Buffalo**

###### **12.1.1.1. Replacement Dairy Stock Management**

- a) Sufficient numbers of young stock should be reared to get enough replacements to reduce buying animals from outside to continue the farm and to reduce the risk of getting diseases into the farm and thereby increasing the profitability & sustainability.
- b) Producer should look for the heifers with the highest growth rate from birth to weaning to select them as replacement of the cull cows or as to increase the volume of his farm.
- c) The heifers must have the record of characteristics to get pregnant by 12-15 months and ability to produce a calf every year with a record of increased milk production.
- d) The replacement heifers must be a source of genetic improvement introducing positive economic traits in fertility, progeny growth and progeny market weight.
- e) Replacement heifers should be with an “average” size (not too big, too small, too tall) and usually built end up being the best and most fertile cows with increased milk yield.
- f) Younger heifers born later in the calving season have less time to be mature enough to have a cycle or two before breeding time.
- g) The replacement heifers should look feminine with good and easy-fleshing rather than blocky, coarse, masculine and looks like a steer.
- h) A highly productive, feminine and fertile heifer having a soft and smooth hair coat compared to a male without having extremely long neck or too short-neck from the cow that are producing for several years with calving every year should be selected.
- i) The heifers having adequate width through the pins that means wide hind quarter with wide birth canal and having adequate slope from hooks to pins reduce difficult birth.
- j) However, the replacement heifers should also be selected following the criteria mentioned earlier under the section **4.1.2.1.2. A.** and under the section **7.2.3.1.1.**
- k) The replacement heifers require floor space of 30-50 sq. ft./head from 8-20 months of age depending on the breeds and body weights.
- l) Heifers’ weight should be monitored regularly and adjusted the feed with supplements to get the target weights for cross heifers about 250 and 300 kg at 18 months of age.

- m) Proper growth rate should be upheld throughout rearing period to get productive heifers.
- n) Replacement heifers with positive selection traits should be given a balanced diet (Appendix 28) with quality roughages and concentrates based on age and body weight.
- o) The selected heifers should be well-reared with balanced ration of adequate energy, protein, and vitamin and mineral supplements for early sexual maturity and cyclicity.
- p) Enough young stock should be reared, especially pregnant heifers to replace culled cows.
- q) Cross breed heifers should be at first calving in 27-30 months old that means they conceived when 18 to 21 months old, so they should be maintained on adequate nutrition to ensure that they are fertile and cycling during 18 to 21 months of age.
- r) Delayed age at first calving reduces dairy productivity by increasing the costs of raising the replacements because of longer feeding periods.
- s) Continued growth of heifers should be ensured to become large enough at calving, minimize dystocia and to maximize the mammary development and lactation.
- t) The replacement management program should be implemented correctly, because the herd productivity can be influenced by the success of the replacement program.
- u) Hence, understocking is recommended in heifer facilities to allow suitable bunk space.
- v) It should be known that a replacement heifer does not earn a profit until middle of the 2nd lactation, so cost of raising heifers significantly affect the overall production cost.
- w) However, use of sexed selected semen and genomic tested AI sires and replacement females (still not available in Bangladesh) can increase the production and profitability.
- x) Use of female sexed semen increases female calves about 85-90% that dramatically increases the number of female replacements available on a dairy farm.
- y) Female calves can be tested for future milk production potential by genomic testing to identify their individual genetic merit, so that with high genetic merit should be selected for milk production.
- z) Records of young stock should be maintained as key information starting from birth that provides valuable information and should include calf ID number, sex of the calf, sire ID number, dam ID number, birth weight, weight at weaning, service and calving, age at weaning and first service, age at first calving etc.
- aa) The replacement heifers should be dewormed and vaccinated against the infective diseases prevalent in Bangladesh (like Appendix 31 and 35) by trained personnel as per advice and under the supervision of a Registered Veterinarian.

**12.1.1.1.1. Nutritional Management of Replacement Dairy Heifers**

- a) Ration of the replacement heifer should be balanced with energy, protein, vitamins and minerals supplements.
- b) A healthy heifer could be started from neonatal stage to 22 months of age with proper feeding and nutrition management through followings:
  - 1) Colostrum management-
    - (a) Calves should be fed about 4 liters colostrum within 12 hours after birth and the colostrum feeding should be continued up to 72 hours.
    - (b) Calves not received recommended dose of colostrum grow at only 2/3rd compared to that received recommended dose of colostrum on time.
  - 2) Feeding whole milk-
    - (a) Milk from the suckling mother or composite milk of the herd.
    - (b) Supplementary milk should be pasteurized, but milk that is intended to use in the hospital, i.e., “hospital milk” is not acceptable.
  - 3) Feeding commercial milk replacers-
    - (a) Commercial milk replacers could be fed, but that should contain appropriate nutrients (Appendix 29).
  - 4) Feeding calf starter-
    - (a) Calves should intake calf starter at 1 kg/day for 3 days before weaning.
    - (b) Calf starters (grains) must have 22-26% protein, although, 10% fat and 18% protein levels in starter feed on DM basis is sufficient for optimum growth of the Sahiwal calves (Sharma *et al.*, 2020).
    - (c) When the calf intake 3 kg calf starter for at least a week, high-quality hay should be introduced to the diet.
  - 5) Calves must have access to free choice water from day 3.
  - 6) Weaning-
    - (a) Weaning of calves should be based upon dry matter intakes.
    - (b) It is possible to wean a calf even at 4 weeks of age.
  - 7) The heifers should not be over-conditioned.
  - 8) Puberty for heifers is governed by size and weight, not age.
  - 9) Protein levels in bred heifer’s diets should be 12 to 14% (DM basis).
  - 10) Feed ionophores (They are feed additives that alter rumen microbial populations through ion transfer across cell the membranes) could be added to feed.

- 11) The ration of the close-up heifer should be as same as the lactating cow to stimulate the rumen papillae to develop.
- 12) Sanitation in all respects must be maintained in raising heifers.
- 13) Nutrient requirements for dairy heifers have been presented in Appendix 28.

#### **12.1.1.2. Meat Herd Management**

##### **12.1.1.2.1. Beef cattle management (beef fattening)**

- a) Cattle should be selected for meat production as per criteria as described before.
- b) In Bangladesh, cattle rearing for meat production is popularly known as ‘beef fattening’ or ‘beef cattle fattening’.
- c) Generally, uncastrated bull calves are selected for beef fattening in Bangladesh for its higher growth rate.
- d) Usually, the cattle are reared for beef fattening in Bangladesh for maximum of 3 to 4 months and commonly at the eve of Eid-ul-Azha, a religious festival of the Muslims.
- e) Bangladesh has a good market of beef fattened cattle due to the high price of beef.
- f) Generally, beef fattening is carried out by stall feeding in Bangladesh, but the animal should allow limited exercise daily to prevent lameness and associated health issues.
- g) Although it is sometimes impossible for the animal owner/farm manager to allow the beef fattened cattle outside the stall due to their aggressive behaviors.
- h) The cattle for beef fattening could be procured from the local market, local cattle farms or selected from their own cattle herd, if any.
- i) However, it is recommended to procure the cattle for beef fattening from the local farm or household to avoid disease occurrence.
- j) If the cattle are bought from the open market, pose a high possibility of carrying disease agent from the market, e.g., Foot and Mouth Disease (FMD) virus is the most common.
- k) After procurement, the cattle should be washed properly with approved antiseptic in water or with soap water followed by wiping dry the body with a towel.
- l) The cattle should be kept separate from other cattle, if any, for at least 21-30 days for observing any abnormality or disease condition (i.e., quarantine), when the animal can take rest and to be familiarized to the new environment.
- m) The cattle should be given fresh feed and drinking water as per its desire and appetite.
- n) If no abnormality is observed, the animal should be given anthelmintic as per advice of a Registered Veterinarian (Appendix 35) after the first week of procurement.

- o) If the animal shows any abnormality or disease condition, it should be treated as per advice of a Registered Veterinarian.
- p) If more than one animal is procured, the sick animal must be kept in an isolated area /house until the animal recovered completely (i.e., isolation).
- q) If no abnormality or disease condition is observed within 21-30 days of procurement or the sick animal recovers completely, the animal could be reared with other animals, and administered anthelmintic to the recovered animal, if not given during quarantine.
- r) The cattle for beef production must receive sufficient fiber, energy, protein, minerals and vitamins for gaining body weight rapidly.
- s) After 21-30 days of quarantine, the animal should be given nutritious feed as per the feeding program and gradually increase feeding.
- t) Intake of more feed at a time can cause acidosis or indigestion leading to diarrhea and associated health problems and result in ultimate body weight loss.
- u) Diarrhea may lead to dehydration and loss of body weight, so the animal should be treated immediately under the supervision of a Registered Veterinarian.
- v) The new ration and feeding increment should be gradually adjusted to the animal and the feeding frequency should be 2-4 times a day.
- w) As the dry rice straw is commonly fed to almost all cattle in Bangladesh including the cattle for beef fattening.
- x) The rice straw should not be fed dry, because it contains hemicellulose that decreases the digestibility of the straw and may create barrier to digest other nutrients in it.
- y) The rice straw should be fed the cattle at least light wetting with clean water, because about 50% of digestibility is increased of the rice straw when it is wetted with water.
- z) However, the rice straw should be fed after being treated with molasses mixed water at least 30 min prior to feeding.
- aa) Urea and molasses treated rice straw could be fed, but care must be taken about urea poisoning that may occur when excessive amount of urea is fed.
- bb) To obtain the urea-molasses solution, 4-5 kg urea is to be added to 100 L of water and stirred so that the urea is completely dissolved and the clump of urea is disappeared, then 10 L of molasses is to be added to the solution and stirred until the molasses and the urea solution gets mixed up very well.
- cc) Air-dried straw is to be soaked very well by spraying/sprinkling the urea-molasses solution uniformly on the straw at ratio of 1:1 (straw:solution).

- dd) The treated straw must be taken into an un-porous polythene bag matching to the volume of the straw and tied the opening of the bag firmly to prevent the entrance of oxygen and from evaporating ammonia from urea, and then the bag with straw left for at least 1 week in a safe area.
- ee) For large scale production of urea-molasses treated straw, polythene covered soil pit or cemented pit can be used, and the size of the pit should be according to the amount and volume of the dry straw.
- ff) In the pit, the straw is to be placed and soaked by sprinkling with urea-molasses solution layer by layer fashion and pressure should be applied on the layer of the straw after being soaked to compact it.
- gg) When the pit is filled with the soaked straw, the pit is covered by an intact polythene sheet making the pit air-tight so as not to enter oxygen into and evaporate ammonia from the treated straw.
- hh) Then some sand filled plastic sacs are placed on the polythene sheet covering the side soil/wall of the pit to apply pressure on the treated straw and left it for at least 1 week.
- ii) The treated straw is aerated for 12 hours before feeding to reduce the concentration of ammonia gas and the feeding of the treated straw should be adapted to the cattle by giving the treated straw mixed with other roughage (grass, hay etc.) for a week or more.
- jj) Both the treated straw and the conventional roughage mixture feed could be given *ad libitum* starting with 10-15% of the treated straw that gradually increased up to 50% of the mixture by 1 to 2 weeks.
- kk) The urea-molasses treated straw fed cattle should have free access to drinking water as they intake more water during the period of urea-molasses treated straw feeding.
- ll) Side by side, the urea-molasses treated straw fed cattle should be regularly fed correctly formulated concentrates with vitamin and mineral supplements.
- mm) Green fodder should be given to the beef fattening cattle at 5-10 kg daily depending on body weight as it is rich in protein, energy, vitamin and mineral, if legume forages is given, it will provide protein level that exceeds protein needs of all classes beef cattle.
- nn) If green grass is supplied as per requirement of the cattle, the cattle will be reluctant to intake urea-molasses treated straw, so less amount of green should be offered to the cattle when they are feeding urea-molasses treated straw.
- oo) The diet should be added with 2.5-3% fat (DM basis) to supplement energy and the concentrate should be fed 2-4 times daily dividing the daily allowance into 2-4 splits.

- pp) The concentrates could be boiled before feeding then mixed with drinking water and vitamin-mineral mixture should be added to concentrate immediately before feeding.
- qq) The amount of intake should be increased gradually for gaining more body weight and sufficient clean drinking water should be supplied 3-4 times daily to cover the daily 25-40 L intake depending on the body weight and the environmental temperature.
- rr) The fattening animal should be de-wormed and vaccinated against the diseases prevailing in Bangladesh as per advice of a Registered Veterinarian (Appendix 31 & 35).
- ss) The animal should be maintained humanely and no stick should be used to control the cattle and not be overcrowded in the vehicle during travel.
- tt) However, the body weight can easily be calculated by using the formula:  
Body Weight (kg) =  $[(L \times G^2)/300] \times 0.4536$ ,  
Where, L= length from the shoulder point to the pin bone,  
G= round length of the body behind the fore legs.

### **12.1.2. Goat and Sheep**

- a) Goats and sheep are reared in the extensive, semi-intensive and even in intensive system of rearing in Bangladesh.
- b) The kids and lambs should be selected after weaning for mutton production and reared allowing floor space in the shelter/stall for goat/sheep as follows:
  - 1) Up to 3 months, 2.0-2.5 sq. ft.
  - 2) 3 months to 6 months, 5-8 sq. ft.
  - 3) 6 months to 12 months, 8-10 sq. ft.
  - 4) Lambs/kids in group, 4 sq. ft.
  - 5) Weaner in groups, 8 sq. ft.
  - 6) Yearling/goatlings, 9 sq. ft.
  - 7) Ewe/doe in groups, 10 sq. ft.
  - 8) Castrated male, 15-20
  - 9) Ram/buck in group, 12-15 sq. ft.
  - 10) Ram/buck individually, 20-25 sq. ft.
  - 11) Ewe/doe with lamb/kid, 16 sq. ft.
- c) The creep feeding should be started from 1 month of age and up to 2-3 months of age.
- d) The creep feed is generally a concentrate mixture and are given to provide more nutrients for their rapid growth and to stimulate their rumen development

- e) Creep feed should contain 22% protein & be fed at 50-100g/animal/day (TNAU, 2022c).
- f) After development of the rumen, 225g when there is plenty of green grass and 450g of concentrate mixture in scarcity of green grass should be fed to the weaned kids and lambs depending on age and body weight (TNAU, 2022c).
- g) After 3-4 months of age, if green grass is available and grazing in the pasture for about 8 hours per day, no need to supplement concentrate.
- h) In poor grazing conditions, kids and lambs should be fed with a concentrate mixture containing 16-18% protein at 100-200g/animal/day to gain weight (TNAU, 2022c).
- i) In poor grazing conditions, the adult goat and sheep should be supplemented with concentrates containing 12% crude protein at 150-350g/animal/day depending on age and the body weight (TNAU, 2022c).
- j) Goats and sheep reared on whole grass should be practiced with the rotational grazing method where the pasture is divided by fence into several sections and the animals are moved sequentially from one section to another resulting in plenty of grass all time.
- k) Under this system, the kids and lambs should graze first on a section and then the older animals should finish up the grass left by the kids and lambs.
- l) Consequently, when the goat and/or sheep complete the grazing the last section of the pasture, the grass in the first section will grown enough to grass by them, and so on.
- m) The feeding and operation costs are lowest in the intensive system, where goats and sheep are reared fully on pasture with no stall feeding, although feeding of a small sum of concentrates could be helpful in maintaining good health and gaining body weight.
- n) The feeding and operation costs are moderately higher in the semi-intensive system, where stall feeding with green fodder and concentrates, and 3-5 hours grazing daily are allowed to maintain good health and to gain body weight.
- o) The feed and operation costs are highest in the Intensive system, where are zero-grazing in which goats and sheep are continuously kept under housing in confinement with no/or limited access to outside and are stall fed with green grass and concentrates to maintain good health and gain body weight, where operation is easy and controlled.
- p) Goats and sheep should be protected from predators and diseases like PPR, anthrax, goat pox etc. by the use of effective vaccines on time, and dewormed every 3-4 months starting from 2-3 months of age as per advice of a Registered Veterinarian.
- q) Care must be taken for exposure to cold environment, especially the goats, they are very much susceptible to cold and may suffer from pneumonia even death.

- r) Floor of the housing should be covered with thick straw bedding and be protected from cold and rainy weather, and the wet bedding must be replaced with dry bedding.
- s) Although the slatted floor does not require bedding, but normally the manure should be cleaned 2-3 times weekly in all cases.
- t) Proper health management like vaccination and de-worming (as Appendix 32 and 35) and sanitation programs must be carried out correctly.

### **12.1.3. Pig**

- a) Weaning involves a major change in both of feed and body temperature in pigs.
- b) Both feed and water intake should be established as soon as possible after weaning to rehydrate, provide energy, maintain body temperature, and to promote gut health.
- c) As the post weaning stressors cause physiological changes to the gastrointestinal tract resulting in more susceptibility to post-weaning diarrhea that can affect performance, so the stressors should be minimized as soon as possible.
- d) As the immunity derived from the sow is declining after weaning, health challenges should be minimized as far as possible, and the poor performers or sick piglets should be identified promptly and treated appropriately, preferably separate feeding.
- e) At weaning, the piglets lose weight up to 200 g/day, so the producer should maintain their growth rates and reduce pen variation by supplying energy and protein rich feed.
- f) Pre-weaning nutrition (creep feed) and management should be optimized with good quality feed at weaning to overcome the challenges and be used for the first 24-48 hours post-weaning without any change in normal feed.
- g) Environmental conditions and piglet behavior should be monitored regularly and carefully to identify the problem as follows:
  - 1) if the piglets lying in huddling may indicate chilling;
  - 2) any vices indicate stocking density issue or insufficient access to feed and water;
  - 3) high levels of noise may indicate stress and
  - 4) dunging in the lying area could be the result of chilling.
- h) Piglets are more comfortable on the floor than the slatted floor, so adequate dry bedding should be provided on the floor.
- i) Fresh diet and drinking water must be given & readily accessible to the piglets allowing feeder and waterer with correct feeder and waterer space and checked once daily.
- j) Feeders and waters must be cleaned daily and set extra feeders and drinkers, if needed.
- k) Adequate floor space must be provided to the piglets, and the wastage feed must be cleaned daily to reduce risk of disease and encourage piglets' intake.

- l) The floor space should be allowed for the piglets as per international standards, which are as follows-
  - 1) Weaner individual piglets: 10-15 sq. ft.
  - 2) Grower individual piglets: 12–20 sq. ft.
- m) But practically, the following floor space could be practiced-
  - 1) Weaner in pen (up to 25 kg/12 wks): 2.5-2.75 sq. ft.
  - 2) Grower in pen (up to 40 kg/17 wks): 4-5 sq. ft.
  - 3) Finisher in pen-
    - (a) up to 60 kg/21 wks: 5-7 sq. ft.
    - (b) up to 90 kg/27 wks: 6-9 sq. ft.
    - (c) up to 120 kg/33 wks: 7.5-10 sq. ft.
- n) Optimum daylight/artificial lighting should be ensured for piglets to find feed and water.
- o) Piglets should be handled and moved gently keeping stress to a minimum.
- p) Mixing of piglets of different litters should be avoided and the piglets should be sorted by size to adjust feeding and minimize the future variation in size and weight in a herd.
- q) The piglets should be divided into groups at weaning according to the size and sex of the piglets such as large boars, small boars and gilts to manage appropriately.
- r) Proper hygiene and sanitation must be maintained in the piglet housing and be reviewed the hygiene and sanitation protocols in relation to the health challenges.
- s) Proper deworming and vaccination against the prevalent diseases should be done on time as per advice of a Registered Veterinarian (like Appendix 33 and 35).
- t) As piglets are used to being 'called' to feed by the sow in the preweaning period, so they should be called 3-4 times a day to feed for the first 2 days to ensure their feeding.
- u) The performances achieved during the post weaning period should be maintained by optimizing water and feed intake, temperature, ventilation and stocking density.
- v) Organic acids can be supplemented in diets in several different forms that are known to lower the pH of the piglet's stomach, which can reduce the occurrence of pathogens such as *Escherichia coli* and *Salmonella spp.* and improve the digestibility of feed, and some organic acids work in the hindgut to provide favorable effect on gut microflora.
- w) Prebiotics and probiotics could be used with feed to support the intestinal gut flora and general health of the piglets.
- x) Pig rearing for pork production should follow an all-in all-out system and pens and equipment must be cleaned, disinfected and dried between batches.

## **CHAPTER XIII**

### **PREVENTION AND CONTROL OF ANIMAL DISEASES**

#### **13.1. Prevention and Control of Animal Diseases**

- a) Prevention of infectious diseases could be achieved by adapting strict biosecurity measures, but the control measures are taken after incidence of an infectious disease.
- b) Preventive measures are general biosecurity measures in case of infectious diseases and the control measures are specific for a particular infectious disease.
- c) In case of metabolic diseases, implementation of the specific prevention procedures and appropriate treatment of them are the main principles.
- d) Preventive measures depend on the prevalence rate of a disease in the host in an area.
- e) Preventing diseases from entering and spreading in animal populations is the most efficient and cost-effective way of managing diseases.
- f) In Bangladesh, there are effective Act and Rules on animal disease prevention and control entitled 'Animal Disease Act, 2005' and 'Animal Disease Rules, 2008' in practice.
- g) These Act and Rules have detailed instructions and directives for prevention and control of animal diseases both at farm level as well as national level.
- h) Although, there is still no any national biosecurity guidelines for animal disease prevention in Bangladesh.
- i) However, owners/farm managers are responsible for the health of their animals, sometimes, the government steps are necessary in preventing or combating a disease, if a disease is exceptionally infectious or dangerous.

#### **13.1.1. Prevention of Animal Diseases**

##### **13.1.1.1. Principles of Animal Disease Prevention**

The basic principles that should always be observed in animal disease prevention:

- a) Implementation of effective biosecurity measures;
- b) Implementation of good hygiene and sanitation programs;
- c) Implementation of integrated pest management program (IPM);
- d) Adoption of extended of animal health program;
- e) Compliance with requirements of the country when importing animals and animal products from outside the country;

- f) Adoption of proper quarantine measures for all new comer animals;
- g) Implementation of appropriate deworming program;
- h) Periodical dipping or spraying program (in April-June and in July-September) for livestock with recommended insecticides to kill lice, flies, fleas, mites and ticks on skin;
- i) Be aware of symptoms of disease in animals, if a disease problem develops, reliable early diagnosis and the best treatment should be provided;
- j) Reporting animal diseases (suspected/diagnosed) to the respective authority;
- k) Precise vaccination schedule for each herd or flock;
- l) Proper disposal of manures and farm wastes;
- m) Disposal of all dead animals by burning, deep burying or in the disposal pit;
- n) Maintaining good records of flock/herd health including vaccination, deworming and dipping history, and other preventive measures, disease occurrence, medication, surveillance and control measures etc.

#### **13.1.1.2. Practice of Animal Disease Prevention**

The management should practice the following to prevent disease entry into the farms:

##### **a) Visitors-**

- 1) Discourage all visitors and limit access to the farm.
- 2) Communicate and explain disease prevention procedures to visitors.
- 3) Ask visitors to provide information about recent farm/animal visits and contacts.
- 4) Clothing worn on other farms must be washed and footwear must be disinfected.
- 5) Have plastic, disposable boots available.
- 6) Consider having overalls available that do not leave the farm.
- 7) No visitors with soiled clothing and/or footwear from other farm must be allowed.
- 8) Do not allow animal products, clothes, luggage, cameras and other items from affected countries onto the farm or offer to disinfect them (at owner's risk).
- 9) Do not allow visitors to walk through feeder/have physical contact with animals.
- 10) Exclude international visitors from the farm for  $\geq 5$  days after arrival Bangladesh.
- 11) Arrange footbath and hand washing facility for visitors and compel them to do so.
- 12) Keep records of all visitors at entry of the farm, if applicable.

**b) Farm Traffic**

- 1) Have one common entrance/exit onto the farm.
- 2) Provide disposable boots or disinfectant footbaths.
- 3) Stop all non-essential vehicles and visitors from entering the farm.
- 4) Arrange collection and delivery of supplies to take place at the farm boundary.
- 5) Keep a record of all deliveries.
- 6) All vehicles that must enter farm premise should be clean of organic material.
- 7) Vehicles that do not need access to farm operations that should be kept at an area with a good distance from animals and feed.

**c) Animals**

- 1) Determine health history of the animal and the source when purchasing them.
- 2) Maintain records of flock/herd health including vaccination, deworming and dipping history, and other preventive measures, disease incidence, medication, surveillance and control measures etc.
- 3) Keep young animals in a separate house from adult animals, as they are more susceptible to diseases than adults.
- 4) Rear animals in the clean house with paved floors.
- 5) Test on the recommendations of the Registered Veterinarian.
- 6) Keep records of all animal movement onto the farm.
- 7) Segregate new additions and returning animals (show animals, custom raised heifers, imported animals etc.) from home herd for 21-30 days, i.e., quarantine.
- 8) Implement strict health monitoring procedures for segregated animals.
- 9) Maintain vaccination, deworming and dipping programs for all animals.
- 10) Aware of symptoms of disease in animals, if a disease problem develops, reliable early diagnosis and the best treatment should be provided.
- 11) Report of animal diseases (suspected/diagnosed) to the respective authority.
- 12) Dispose all dead animals by burning, deep burying or in the disposal pit.
- 13) Consult with the Registered Veterinarian on a farm-specific program.

**d) Minimize non-resident animal contact.**

- 1) Prevent contact with other animals (transport vehicles, sale barns, shows etc.).
- 2) Control stray dogs and cats.
- 3) Implement management practices to limit direct contact with wildlife.
- 4) Implement control measures for birds and rodents.
- 5) Pay particular attention to animal feed.
- 6) Implement an IPM program to control insects and parasites.

**e) Feed and water**

- 1) Purchased feed may be a source of disease and chemical contaminants.
- 2) Purchase feed from sources using quality control measures to minimize the risk.
- 3) Ensure that purchased feeds do not contain protein from ruminant and swine.
- 4) Prevent contamination of feed in the troughs and water in the waterers.
- 5) Scrub and clean feed and water troughs regularly, whitewash the interior weekly.
- 6) Control pasture borne helminthic infections by good grazing management.
- 7) Follow rotational grazing to minimize or limit the infection from pasture.

**f) Manure**

- 1) Dispose manure appropriately and should be used to produce biogas.
- 2) Prevent manure to spread in the farm area without treatment.
- 3) Protect against manure entry onto the farm from vehicles and equipment, or runoff from neighboring animal premises.
- 4) Avoid use of manure or manure products and municipal waste from off premise unless products are certified pathogen free.

**g) Hygiene and sanitation program**

- 1) All workers of any level must wear a gown, disposable hair cape, mask, boot with disposable shoe cover, and maintain strict personal hygiene.
- 2) All workers of any level must follow dipping shoes into the footbath, change of dress (where necessary) and hand washing at the entry of the farm.
- 3) Nobody should come into contact with the animals, feed, water, egg and milking process except the respective workers.

- 4) The persons, those who are necessary to come into contact with the animals, feed, water, egg and milking process required for farm, animal or animal product management must follow the strict personal hygiene and biosecurity measures.
- 5) Scrub and wash animal houses/sheds/pens daily and allow sunlight on houses and disinfect them twice weekly.
- 6) Remove all filth first then use disinfection, because the power of disinfectants is greatly reduced in the presence of organic matter like filth.
- 7) Remove any infectious material, like carcass, aborted fetus, dung etc. from pasture and manage the pasture following the measures mentioned below:
  - (a) Prevent animals from grazing on the pasture under 3 to 4 months of age.
  - (b) Plough pasture and left fallow for 6 months to destroy pathogens by sun.
  - (c) Eliminate parasites from the host for preventing pasture contamination.
  - (d) Use ovicidal drugs to destroy parasite eggs to prevent contamination of premise.
  - (e) Use larvicidal drugs prior to rainy seasons to prevent pasture contamination.
  - (f) Reduce stocking and overstocking from the pens and pastures that significantly reduce parasite burden in animals and contamination in sheds and pastures.

***h) Integrated pest management program (IPM)***

- 1) Limit contact between intermediate and final hosts by improving management.
- 2) Reduce or eliminate intermediate host (e.g., snail) populations by using chemical (e.g., molluscides) or biological control (e.g., ducks).
- 3) Reduce the number of insects by using approved chemicals (insecticides/acaricides), biological control (hymenopterous insects, entomopathogenic fungi etc.) and genetic control (sterile male technique, chromosomal translocation).
- 4) Use of vaccines at appropriate times may control the vector population.
- 5) Control certain reservoirs of parasites, e.g., rodents for *Leishmania* and antelopes for African trypanosomes.
- 6) Remove and clean manure, filth, damp and dark corners, stagnant water etc. periodically that are all favorite breeding places of insects.
- 7) Remove eggs of ticks and mites periodically that deposited in cracks and crevices in the walls, floors and wood work of the animal houses.

- 8) Periodical dipping or spraying of animals with recommended insecticides to prevent lice, flies, fleas, mites and ticks on skin of animals.
- 9) Areas around animal sheds should also be kept dry and clean.
- 10) Interior of animal sheds (roofs, walls and corners) should be cleared regularly of cobwebs and spider webs and sprayed with insecticides at least once in a month.

***i) Quarantine for newly purchased (locally or imported) animals***

- 1) Quarantine is the segregation of apparently healthy animals that brought into the herd for the first time or have been exposed to the risk of infection.
- 2) The idea is to give sufficient time for any contagious disease that the quarantine animal may be exposed to develop and show signs and symptoms of that disease.
- 3) Although the quarantine period depends on the incubation period of a disease, 30 days quarantine period is the common practice, which covers almost all diseases.
- 4) However, for rabies, the quarantine period should be about six months.
- 5) During the quarantine, animals should be thoroughly screened for parasitic infestation by fecal examination and dewormed on the 23rd/24th day, if needed.
- 6) The animals should also be subjected to dipping or spraying on the 25th/26th day for removing ectoparasites, if any.

**13.1.2. Control of Animal Diseases**

**13.1.2.1. General Considerations for Animal Disease Control**

There is a range of factors that have to be considered and evaluated before starting the control procedures against an animal disease. These are mentioned below:

***a) Biological factors***

- 1) Species affected
- 2) Zoonotic potential
- 3) Genetic stability and diversity of the agent
- 4) Distribution and density of susceptible species
- 5) Wildlife reservoir
- 6) Modes of transmission (e.g. vector transmission)
- 7) Transmissibility - Current extent of disease
- 8) Survival in the environment
- 9) Carrier state

**b) Availability of technical tools and resources**

- 1) Diagnostic tests
- 2) Vaccines
- 3) Treatment
- 4) Disinfectants and insecticides
- 5) Disposal facilities
- 6) Trained personnel

**c) Socioeconomic considerations**

- 1) Cost and benefits of intervention
- 2) Availability of resources
- 3) Structure of livestock production systems
- 4) Public health implications
- 5) Logistics and ease of implementation,
- 6) Stakeholder engagement
- 7) Environmental impact
- 8) Political will
- 9) Incentives and compensation
- 10) Acceptance of the public  
(e.g. animal welfare implications, culling of animals, destruction of food)
- 11) Safe commodities for trade
- 12) Governance and institutional arrangements
- 13) Distribution of roles and responsibilities
- 14) Budget and financial resources planning

**13.1.2.2. Practices of Animal Disease Control**

There are several measures to complete the control of an animal disease in a country as well as in the world. These are mentioned below:

**a) Effective surveillance**

Surveillance is 'the systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken' (WOAH Terrestrial Animal Health Code). The surveillance should be continued to the affected and non-affected herds to know the status of the disease and any change that may occur in the agents, it may be genetical and/or behavioral change etc., and to recommend the authority to take action accordingly.

***b) Early detection***

An early detection system enables the timely detection and identification of an invasion or emergence/re-emergence of a disease/infection in a country, zone or compartment. Early detection includes surveillance for diseases, specimen collection and reliable diagnosis of disease agent.

***c) Transparency in declaration***

Bangladesh like other WOAHP Member Country undertakes to report the terrestrial and aquatic animal health situation in its country in a timely and transparent manner. So, outbreak of a disease should be declared and reported to the WOAHP transparently by the veterinary authority as early as possible after diagnosis of the disease.

***d) Rapid response mechanisms***

Rapid response includes disease investigation, implementation of strict biosecurity in the affected and the surrounding areas and vaccination of the healthy animals in the surrounding areas that are not still affected with quality vaccines maintaining cool chain, if necessary, during storage and delivery. Although, vaccination is very useful in the prevention and control of many diseases, vaccination on its own will not usually achieve the desired results unless the vaccination program is part of an integrated control strategy utilizing a combination of control measures.

***e) Animal identification and traceability***

In case of outbreaks, animal identification and traceability will make it easier to identify animals and animal products potentially exposed to the pathogen and allow them to be traced, so that the appropriate control measures can be implemented.

***f) Movement control***

Limiting the risk of any further spread of the disease from premises connected with, or in the vicinity of, the infected premises through movement bans, application of cleansing and disinfection and heightened biosecurity measures.

**g) *Stamping-out, slaughter or pre-emptive slaughter***

To control the detected disease, the susceptible animals are humane culled swiftly and effectively on the infected premises and animals identified as “dangerous contacts”. This type of culling is carried out by stamping-out, slaughter or pre-emptive slaughter of the infected and susceptible animals.

**h) *Import or export restrictions***

Immediately after detection of a disease that to be controlled, the country authority bans import and export of that disease related animals and animal products until the disease is controlled.

**i) *Zoning or compartmentalization***

The zoning is the division of the geographical areas of a country generally with 3 color symbol, such as Red zone, Yellow zone and Green zone. Red zone indicates the dangerous area where the disease has already been spreading. The Yellow zone is generally the surrounding areas of the Red zone and that means that areas where the disease still not spreading, but there is a possibility of spreading the disease. The Green zone indicates that area where the disease still not spreading and there is a less possibility of spreading the disease.

**j) *Isolation and quarantine***

The affected animals are isolated from the herd and the apparently animals, but potentially exposed to the disease are submitted into quarantine. The isolated animals are given appropriate treatment, if applicable, and the quarantined animals are observed closely for development of signs and symptoms of the exposed disease.

**k) *Cleaning and disinfection***

The affected premises, equipment and others that come into contact with animals are cleaned and disinfected after stamping-out, slaughter or pre-emptive slaughter, and all premises, equipment and others that come into contact with animals of the Red, Yellow and Green zones until the disease is declared under control.

***l) Vector and reservoir control***

The vectors and reservoirs are generally controlled by implementing IPM and dipping animals into appropriate insecticides. The reservoir of a disease should be identified and be controlled by applying recommended methods.

***m) Treatment of animal products and by-products***

Suspected animal products and byproducts are treated with antibiotics for removal of bacteria, and for other agents like virus and parasites that can be treated by heat or irradiation. Heat and irradiation also kill bacteria. Generally, recommended method is used to treat the animal product and by products to remove the disease agents.

***n) Other veterinary measures***

Among all the veterinary measures such as vaccination, dipping and deworming, vaccination and dipping have been discussed earlier. However, deworming program is generally implemented by using anthelmintic, larvicides and ovicidal drugs to animals.

***o) Review and evaluation***

All of the measures of the disease control should be reviewed and evaluated. If any gape or failure identified, that could be reported to the competent authority and recommend to correct them or to take necessary actions.

***p) Herd accreditation***

An accredited herd is one that has passed at least two consecutive annual respective official tests for a particular disease and has no evidence of that disease and all animals in a herd must be free from that disease.

## CHAPTER XIV

### OTHER PRACTICES IN ANIMAL MANAGEMENT

#### 14.1. Other Practices in Animal Management

The farm personnel should perform the following works in addition to their routine schedules using appropriate tools and equipment, observing proper procedure (including restraint and pain management), and keep records of such activities. These are:

- |                             |                              |
|-----------------------------|------------------------------|
| a) Castration               | e) Dipping                   |
| b) Hoof trimming            | f) Bathing and Showering     |
| c) Shoeing of Cattle        | g) Grooming                  |
| d) Disbudding and dehorning | h) Exercising of Livestock   |
| e) Extra teat removal       | i) Broody Control in Poultry |

##### 14.1.1. Castration of Males

- Castration of a young male is the process of removal or destruction of the testicles.
- Young age is preferred for castrating male offspring of cattle, buffalo, goat, sheep and pig for ease of the procedure.
- Castration is usually carried out using the open method by surgical removal of testicles or using emasculator/Bortuzzo castrator by destruction of spermatic cords and vessels.
- Another method of castration and that is done by using tight rubber rings to the neck of the scrotum just above the testes and the structures below the ring have their blood supply interrupted, degenerated and die, and then dropped off after a period of time.
- Rubber ring castration is frequently used in young sheep and occasionally in young animals of other livestock species, but it is painful and hampers animal welfare.
- Surgical castration is performed from day-old to older age whereas the Burdizzo castrator is used in comparatively older males.

##### 14.1.2. Hoof Trimming

- Weight bearing in the normal hoof occurs on the outer horny portion and when weight-bearing is shifted from this area, lameness occurs commonly in animals.
- As the hooves normally grow in all domestic animals, they should be trimmed on time to keep the animal to walk normally without lameness.

- c) Like all other animals, the bovine hooves grow and the growth rate is approximately 2 inches per year (Reichenbach and Amaral-Phillips, 2022).
- d) The growth of the hooves should be trimmed twice yearly and hoof trimming may alleviate pain associated with some diseases (digital dermatitis, hairy heel warts etc.).
- e) Objective of hoof trimming is to provide a flat surface for weight-bearing that redirects the weight on sole and distributes it evenly across horny surface.
- f) One common practice of hoof trimming is at dry-off and then again at 100 days in milk in case of cattle, although it can be done twice yearly during any part of the year.
- g) The hooves should be trimmed following proper trimming procedures using suitable instruments by skill professional personnel and the record should be kept.
- h) The digit height should be equal and an ideal heel will be 1.5 inches from hairline to sole in cattle and that should be maintained.
- i) Over-trimming of hooves must be avoided, because that can be destructive to the structural stability of the hoof that can cause pain leading to lameness of the animal.
- j) Any over-trimming, wrong-trimming or not/late trimming of hooves, or any variation in hoof trimming may lead to discomfort in weight bearing resulting in lameness.
- k) Correct trimming of hooves maintaining a schedule can prevent and decrease lameness leading to increased animal welfare, production, and longevity of production and animal.
- l) The basic techniques of hoof trimming in cattle are described in Appendix 36.

#### **14.1.3. Shoeing of Cattle**

- a) Shoes are made of wrought iron (shaped iron), mild steel bar or duralumin (a hard, light alloy of aluminum with copper and other elements) and are put generally under the hoof of animals.
- b) Shoes are used to prevent from excess wearing down of feet and slipping of working animals on floor, and to prevent from possible lameness, foot rot due to excessively worn out of hoof and subsequent infected parts of the hoof.
- c) Precautions to be taken during shoeing an animal:
  - 1) The bearing surfaces of the shoe and foot should be leveled properly.
  - 2) Proper angle of the hoof should be preserved.
  - 3) Each side of the foot must be leveled when viewed from behind.
  - 4) The outer circumference of the shoe should follow the hoof wall with no variation.

- 5) Shoe should be as light as possible, consistent and able to survive wear for a month.
- 6) A minimum necessary number of nails should be used.
- 7) The stumps nail left after the point has been wrenched off (is called “Clench”) when beaten down to form a small hook.
- 8) The outer surface of the wall of the hoof should be left untouched.
- 9) If nail length is not sufficient to clench up, it must be withdrawn & a new one is driven.
- 10) Nails are driven in the right way, otherwise it may cause injury to sensitive laminae.
- 11) Both foot and shoe must fit each other.
- 12) The outer surface of the wall should never be rasped or cut except-
  - (a) To make beds for clenches and clips.
  - (b) In certain cases of brushing.
  - (c) Very occasionally long toes may have to be ‘dumped’.
- d) The indiscriminate use of rasp on the outer surface removes the petiole and allows excessive evaporation of moisture predisposing it to brittle feet, which splits easily.
- e) The procedure of shoeing in animals is described in the Appendix 37.

#### **14.1.4. Disbudding and Dehorning**

- a) Horn serves no useful purpose but dehorned animals need less space in the sheds.
- b) Cattle with horns impose bruises on each other that may result in economic losses.
- c) Horned animals are dangerous to manager and dehorned animals are easy to handle.
- d) Dehorning prevents the occurrence of horn cancer.
- e) Disbudding is the arresting of horn growth at early age, when horn root is in bud stage.
- f) Disbudding age is usually 15-20 days and can be done using the ‘hot iron method’ or ‘chemical method’.
- g) Dehorning is the extraction of grown horn and can be performed using the ‘elastator method’ or ‘dehorning saw/clippers method’.
- h) However, in both of the method, local anesthesia should be used.
- i) The procedures of disbudding and dehorning are described in the Appendix 38.

#### **14.1.5. Extra Teat Removal**

- a) Normal udder of the cow has 4, but that of the goat and the sheep have 2 equal size firmly placed teats, but few animals with one and even two extra teats are also seen and they may be blind or leaky.
- b) It should be removed at age around 6 months of calves and 2 months of kids and lambs.
- c) After controlling the animals, the region of the extra teat is thoroughly cleaned and disinfected with Tincture iodine and marked the extra teats before removal.
- d) The extra teats are clipped off with scissors.
- e) Some more tincture iodine in cotton is used on teared skin after finishing the process.
- f) In the older animals, suture is put in order to arrest bleeding and earlier healing.

#### **14.1.6. Dipping**

- a) Dipping is the procedure used for treatment, prevention and control of external parasites (tick, lice, fly, mites etc.) and some infections by immersing/wetting/soaking/dusting animals (cattle, sheep, goat, pig and poultry) or their body parts briefly in/with a solution of chemical/medicine/ pesticides and even applying chemical/medicine/ pesticides topically on their body.
- b) Typically, a dip is designed as a narrow channel (about the width of the animal) through which the animals walk, immersing them in progressively deeper liquid until the animal is completely immersed, and the channel then becomes progressively shallower until the animal exits.
- c) Dipping is an internationally recognized method for treating ectoparasites in livestock.
- d) Dipping is used for sheep widely, for cattle and goat as required, and for pigs and poultry occasionally probably due to the thickness of their hairs/wool/feathers, as ectoparasites nest in the hairs/wool/feathers comfortably.

##### **14.1.6.1. Types Dipping**

There are nine methods using in dipping livestock and poultry as follows:

- a) Plunge Dip/Dipping Vat/Dipping Tank/Dip- is a bath designed to immerse livestock in liquid pesticide or other treatment, and is widely used for cattle, sheep and goat.
- b) Spray Race and Spray-dip Machine- is a jet of liquid in fine drops, coarser than a vapor; produced by forcing the liquid from the minute opening nozzle mixed with air, and widely used for cattle, and occasionally used for sheep, goat and pig.

- c) Topical Treatments/Pour-Ons/Spot-Ons/Back Spraying - is any medication applied or pouring a small quantity of dip into parts of the body surface along the back, sides and belly, and can be used for cattle, sheep, goat, pig and poultry.
- d) Hand Spraying- is spraying repellent or insecticide solution over the backs and sides of the animals, an effective method of controlling external parasites in tropical countries, and can be used for cattle, sheep, goat, pig and poultry.
- e) Hand Dressing- is the topical application of tick greases or oils to parts of the animal body where ticks gather (e.g., in the ears, under the tail-head), and can be used for cattle, sheep, goat and pig.
- f) Belly-baths/Belly-dipping- is a dipping method where animals are immersed up to their belly by walking into a medicated solution with 1.5 – 2.0 ft. depth, is generally used for sheep and goats.
- g) Foot-dipping/Foot bathing- is a dipping method where animals immerse only their feet by walking into a medicated solution with 0.5-10 ft depth, generally used for sheep and goats, sometimes for cattle.
- h) Hand Bath- is a method of dipping where small number of animals and birds are treated immersing them into dip taking in a bucket, bowl etc., and can be used for sheep, goat, pig and poultry.
- i) Sandpit dipping/sand bath/dust bath- is a method of dipping where dusting of poultry under each wing and tail may be done mechanically or by means of a sandpit with dip-treated sand.

#### **14.1.6.1.1. Plunge Dip**

- a) Plunge dip tanks provide a highly effective method of treating large numbers of animals by immersing them in the dip with acaricides/pesticides for ectoparasite control.
- b) Plunge dip is a construction that allows to completely immerse livestock in a liquid that contains an acaricide/pesticides to control ectoparasites on animals effectively.
- c) Plunge dips are either fixed and made of concrete (typical for cattle and sheep) or portable (usually metallic, mainly for sheep and goats, and seldom for pigs).
- d) Fixed dips must be long, wide and deep enough to ensure that the animal completely gets immersed when plunging and to swim a few meters before touching the bottom.
- e) However, ectoparasite control may fail, if the correct procedure is not used.

- f) It is essential to keep accurate dipping and replenishment records; under strength dipping leads to inadequate tick control and tick resistance to acaricides.
- g) Every animal, except very small infants and advanced pregnant animals, must be dipped every dip day (the day of a week or month specified for dipping animals).
- h) Any animal not going through the plunge must be hand-sprayed or dressed.
- i) Dipping of pigs may be applied to small numbers that with advanced mange should be scrubbed to ensure thorough wetting.
- j) Workers involved in process of dipping must take proper safety precaution, especially by wearing proper personal protective equipment (PPE).
- k) Training of workers will be necessary on safety and hazards of animal handling, animal dipping and chemicals.
- l) Although using an animal dip is time consuming, but it is ultimately vital to the farm's productivity and livestock's welfare.
- m) However, components of plunge dip, plunge dipping procedure and advantages and disadvantages of plunge dipping have described in Appendix 39.

**14.1.6.1.2. Spray Race and Spray-Dip Machine**

- a) Spray race and spray-dip machine are a compromise between spraying and dipping in that these devices utilize smaller amounts of acaricides/pesticides than dipping tanks.
- b) The animals are treated individually by acaricides/pesticides applied under pressure through a system of nozzles directed to all areas of the animal's body.
- c) A spray race is usually permanently installed and includes an entrance chute and a drain pen that collects, filters and recirculates the excess fluids through the pump.
- d) A spray-dip machine is portable and self-contained, and is so operated that the animals remain in the machine long enough for excess fluids to drain back into the collecting tank beneath the spray chamber.
- e) The spray-dip machine must be constantly cared for and maintained in peak condition if they are to apply acaricides/pesticides adequately and efficiently to livestock.
- f) Its main principle of operation is showering of animals with acaricides/pesticides rather than immersing into the acaricides/pesticides solution.
- g) Animals walk through a confined area (race) where a pipe system with many nozzles (usually 20 - 30) are fitted at certain intervals and at particular angles.
- h) The animals are wetted as they walk through the length of the race with dip-wash sprays coming through the nozzles.

- i) The nozzles are placed at strategic places on the side, floor and overhead pipes and at such angles that the animal gets wetted from all sides.
- j) The wash is drawn from a reservoir through a centrifugal pump driven by an engine or tractor and is circulated under pressure through the piping to the nozzles.
- k) However, the components of a spray race, spraying procedure, and advantages and disadvantages of spray race have been described in Appendix 40.

**14.1.6.1.3. Topical Treatments/Pour-Ons/Spot-Ons/Back-Spraying**

- a) Pour-on is the application of chemical or medication drench to the different parts of the animal's body (back, sides and belly etc.).
- b) The process involves a water-based chemical or medication solution applied to the animal generally through a squirting pump and is the most common method.
- c) The chemical then seeps into the skin of the animal and then into the bloodstream of the animal protecting and eradicating the parasites on the animal.
- d) Pour-on options have now become the most popular option due to the speed of application allowing large numbers of animals to be processed quickly.
- e) The amount of drench used depends on the body weight of the animals (normally the drench is 1 or 2 mL per 10–20 kg body weight).
- f) Advantages and disadvantages of Topical Treatments/Pour-Ons/Spot-Ons/Back-spraying have been described in Appendix 41.

**14.1.6.1.4. Hand Spraying**

- a) Hand spraying should only be attempted when less than 25 animals are involved.
- b) Hand spraying requires at least 10 L of dip-wash to properly wet one cattle.
- c) Spraying equipment is portable and only small amounts of acaricides/pesticides need to be mixed for a single application.
- d) However, it is very difficult to wet all the body parts of an animal, moreover, a high-pressure spray pump is needed to ensure wetting thorough the skin.
- e) Spraying pumps will apply acaricides/pesticides under a pressure of 27 to 45 kg.
- f) In most areas, hand-operated pumps have been replaced by motor-driven pumps capable of generating pressures as high as 90 to 136 kg.
- g) Care is needed to treat the ears, axillae, and other inaccessible areas on animals.
- h) Advantages and disadvantages of Hand Spraying are mentioned in Appendix 42.

**14.1.6.1.5. Hand Dressing**

- a) Hand dressing procedure involves applying acaricide/pesticide to the preferred host attachment sites based on the tick species (i.e., ears, udder, scrotum, neck etc.).
- b) In certain instances, as when a species of tick inhabits a limited area of an animal's body, acaricides/pesticides may be applied to these areas by hand, e.g., larvae and nymphs of *Otobius megnini* are found only in the ears of cattle and other animals.
- c) The application of insecticides with aerosols and in oils, smears, and dusts by hand is time-consuming and laborious, but in certain instances, it may be more effective and economical (in terms of acaricide cost) than treating the entire animal.
- d) This method is sometimes used where animals cannot be brought to the dipping tank, where severe localized infestation or the presence of clusters of ticks in the ears, under the tail or on bare parts occurs.
- e) Hand-dressing materials/medications are applied to parts where ticks are clustering.
- f) It should never be treated large areas of the body, as the animal may be poisoned.
- g) Hand dressing products can be poured on or painted on the infected parts of cattle and sheep/goats and aerosol products can be applied to heavily infected body parts.
- h) Hand-dressing can be considered suitable for small livestock operations.
- i) This procedure is time consuming and cannot be suitable for large scale application.

**14.1.6.1.6. Belly-Baths/Belly-Dipping**

- a) Belly dipping is for control of paralysis ticks and is generally used in sheep and goats.
- b) The dip-wash depth is utmost important and that for belly dipping should be 50-60 cm.
- c) Dipping-tank capacity must be known to establish the correct dip wash strength initially.
- d) Replenishing must be done regularly to maintain the correct strength that will ensure that the first as well as the last animal dipped will come into contact with the correct concentration of dip-wash to ensure good results.
- e) Larger dipping-tanks (4000-5000L) are replenished less than smaller tanks (2000-3000L).
- f) However, it is essential to replenish with fresh water and dipping-chemical at the given replenishing rate, before one third of the dip wash has been removed by the animals.

**14.1.6.1.7. Foot-Dipping/Foot Bathing**

- a) Foot-dipping is recommended for the control of the paralysis ticks.
- b) There is a lot of merit in constant replenishing from a replenishing tank standing next to the dipping-tank.
- c) The dip-wash depth is important and that for foot-dipping should be 15 to 30 cm.
- d) The constant replenishment method is also recommended and that ensures both correct strength and depth of dip-wash throughout the dipping process.

**14.1.6.1.8. Hand Bath**

- a) The hand bath should be used for small flocks of sheep, goat, pig and poultry.
- b) Each animal is lifted into the bath and turned over on its back.
- c) A hand bath tank may have a 10-14-gallon capacity with dimensions of 24"Wx30"H.
- d) The animals are dipped in one pen together, but the horned rams and bucks are dipped separately.
- e) The dip is re-charged with chemical concentrate at appropriate intervals and the run-off from freshly-dipped animals should be drained back into the bath.
- f) The bath should be cleaned, if it becomes soiled, and the spent dip wash should be disposed properly at the end.

**14.1.6.1.9. Sandpit Dipping/Sand Bath/Dust Bath**

- a) Dusting of poultry under each wing and tail may be done mechanically or by means of a sandpit with dip-treated sand.

**14.1.6.2. Acaricides, Pesticides, Insecticides and Chemicals Used in Dips**

Acaricides, Pesticides, insecticides and chemicals generally used in dips are-

- a) Presently, amitraz based products (Aazdieno, Acarac, Amitraze, Avartin, Baam, Edrizan, Maitac, Mitac, Mitaban, Triatox, Triatix, Vapcozin Taktic, Triazid, Topline, Tudy, Ectodex, Garial, Danicut, Ovidrex, Acadrex, Bumetran, and Ovasyn) are widely used in dips for cattle, sheep and goats.
- b) Amitraz is a non-systemic acaricide, insecticide and its synergist and scabicide, and has also been described as an insect repellent.
- c) However, amitraz is not an organophosphate compound, but a formamidine compound.
- d) Among the amitraz products, Triatix is the most popular products for using in dips for cattle, sheep and goats, and applying as per manufacturer's instructions.
- e) Other than amitraz (formamidine), chlorinated hydrocarbons, organophosphates, carbamates, pyrethroids and ivermectin are used in livestock dips.

- f) Bayticol, a Flumethrin (Pyrethroid insecticide) based product are also used in cattle dips and spray where required to comply with a risk minimization requirement.
- g) MultiDip is used with a combination of emulsifiable concentrate in a Plunge dip/Spray race/Hand spray that controls ticks and kills lice on cattle.
- h) The dips for cattle are particularly effective against ticks as it has a tick detaching effect.
- i) Sheep dips contain 3 main classes of chemical: Organophosphate (diazinon), Pyrethroid (cypermethrin) and Formamidine (amitraz)
- j) Sheep dips containing organophosphates and cypermethrin are extremely effective in their jobs of eliminating and preventing a number of serious sheep ectoparasites, namely blow fly (bluebottle) strike, lice, keds, ticks and sheep scab.
- k) However, only mature animals are generally dipped, but the infants are hand treated.
- l) Birds are treated with a powder or spray containing, e.g. trichlorphon (an organo-chloro-phosphate compound and organophosphate acetylcholinesterase inhibitor) or malathion (organophosphate compound) to control external parasites.

#### **14.1.6.3. Frequency of Dipping**

##### **14.1.6.3.1. In Cattle**

- a) For ticks, flies and screw worms: dipping or spraying weekly,
- b) For lice: dipping or spraying when necessary
- c) However, concentration should be given on the ears, under the tail and in tail brush.

##### **14.1.6.3.2. In Goats and Sheep**

- a) Dipping should be done twice in a week to kill sheep scab, itch and goat mange mites.
- b) It should be ensured that the animals are immersed for about 1 minute with the heads being submerged at least 3 times to ensure that the inside of the ears are fully wetted.
- c) Dipping for sheep typically takes place 2 weeks before tupping (allowing to rams for mating), when ewes are given their pre-tupping check at the start of October.

##### **14.1.6.3.3. In Pigs**

- a) Pig are generally dipped when necessary.

##### **14.1.6.3.4. In Poultry**

- a) Poultry are treated for ectoparasites for not more than every 14 days.

#### **14.1.6.4. Precautions of Dipping**

##### **14.1.6.4.1. Precautions before Dipping**

- (a) Dip animals calmly and quietly, and minimize stress.
- (b) Dip animals in early morning on a bright, sunny day (neither too hot nor too cold) so that the treated animals will dry quickly and the insecticide will not be diluted by rain.
- (c) Dip of livestock and poultry using only acaricides/pesticides approved by the competent authority, livestock production specialist or a Registered Veterinarian.
- (d) Use acaricides/pesticides safely that is essential to an efficient and well-run program for the control of ectoparasites.
- (e) Be aware of safe practices when mixing or applying acaricides/pesticides, and do not eat, drink or smoke during application.
- (f) Add concentrate acaricides/pesticides to water/dip preferably by using a closed dispensing system and should not be poured directly from the product container.
- (g) Wear appropriate personal protective equipment (PPE) during handling, dilution, dispensing and disposing the dip chemicals, during dipping process, and handling of animals before and after dipping to avoid contact with the treatment.
- (h) In accidentally exposed to an acaricides/pesticides, wash it off thoroughly and change clothes immediately, and if symptoms of poisoning (exhaustion and weakness accompanied abdominal pains, diarrhea, excessive sweating, constricted pupils, salivation etc.) appear, the patient should immediately be hospitalized.
- (i) Be sure that spraying equipment is clean and working properly, and especially that it provides sufficient agitation to allow for thorough mixing of acaricides/pesticides.
- (j) Remove food overnight so there is less contamination of the dip by manure.
- (k) Allow animals to rest and to drink water before dipping that the animals will not drink the dip, which may cause poisoning.
- (l) Don't dip sick, with wounds and advanced pregnancy, young stock (lambs/kids/piglets <1 month old and cattle below 120kg body weight) and stock being sent for slaughter.
- (m) Make sure that the dipping tank is clean before mixing the fluid in case of hand bath.
- (n) Separate the animals (especially sheep and goats) into various age groups to prevent the larger animals being dipped together with smaller ones.
- (o) Dip sheep/goats/pigs in pen together, dip horned rams/bucks/ boars separately, dip young and valuable sheep/goats/pigs first, and dip sheep/goats with lumpy wool last.

- (p) Don't place ewes/does/sow and lambs/kids/piglets in the tank at the same time.
- (q) Don't dip recently shorn sheep/goat, allow 14 days of shearing for wound healing.
- (r) Don't dip sheep/goat with long wool, though lice infestation is a problem, apply other measures until shearing.

**14.1.6.4.2. Precautions after Dipping**

- (a) Monitor the animals in the draining pen for any trouble or side-effect of the dip.
- (b) Keep animals in the holding/draining pen for at least 10 to 20 min to drain wash properly, thus avoiding wastage of dip and resultant pollution of the environment.
- (c) Don't return treated animals to their resident shed until it is fully cleaned and dried.
- (d) Provide fresh clean drinking water to the treated animals after drying properly.
- (e) Don't drive the treated animals for long distances immediately after dipping.
- (f) Keep the treated animals in the shed after drying for at least 24 hours before return to pasture containing water courses to avoid environmental contamination.
- (g) Dispose all used dips in the disposal tank so they cannot contaminate the surrounding environment including the water courses.
- (h) Dispose the spent foot bath solution carefully as per manufacturer's instructions.
- (i) Dispose all containers, unused concentrate, and used acaricides/pesticides as per manufacturer's instructions to avoid environmental contamination.
- (j) Follow environmental guidelines specified by the competent authority, if any.

**Notes:**

1. Dipping is the only way to control scab, ticks, lice, blowfly and keds with one product.
2. Dipping may have side-effects in animals including excessive salivation and tears, frequent urination, vomiting, difficulty in breathing, incoordination, muscle twitching, paralysis, collapse and even death, and may have increased risk of bacterial infection.
3. Sometimes oral treatments or injections of some chlorinated hydrocarbon insecticides have controlled *Boophilus microplus* on cattle.
4. Also, oral treatments with animal systemic insecticides have controlled several species of ticks feeding on livestock.
5. However, the oral method will probably not be practical on a large scale, though it may be useful in certain limited situations.

### **14.1.7. Bathing/Showering for Cleaning and Cooling of Animals**

#### **14.1.7.1. Livestock**

- a) Bathing/showering (of farm animal) is the process of cleaning and cooling the whole body of the animal generally with water to keep them healthy with a healthy skin by removing dust, dirt, manure, sweat, parasites and other contaminants from skin and hair, and cooling the animals by lowering the body temperature.
- b) Animals obviously get dirty from time to time and may need to be bathed for cleaning.
- c) Regular bathing/showering improves cleanliness, appearance and temperament, increases blood circulation, and stimulates skin that makes the coat shiny.
- d) Bathing/showering allow animals to become cool, calm, docile and to feel comfort.
- e) Bathing/showering of animals, especially dairy cows, is also necessary to combat the negative effects of heat stress (increased body temperature and respiration rate; reduced physical activities, feed intake and milk production; and decreased reproductive performance).
- f) Regular bathing/showering develops trust, confidence and positive relationship between animal and its owner/handler/farmer.
- g) Dairy cows also need to be cleaned regularly by showering/bathing before milking to get a hygienic milk by preventing contamination.
- h) For the better health of the animal's hooves, footbath should be provided regularly.
- i) Other than bathing/showering, water is used to cool animal, especially in cattle and to reduce the effects of heat stress by sprinkling, misting, spreading or showering for wetting the animal's back (not the head).
- j) The procedure of bathing and/or showering of livestock is described in Appendix 43 and the cooling and cleaning of cows have been described in Appendix 44.

#### **14.1.7.2. Poultry**

- a) Many birds including chicken take dust/sand baths and never bathe in water at all.
- b) The bird scratches the dirt until it is loose or finds a sandy or dusty area and then lies down and throws the powdery dirt all over its body and wings.
- c) Its feathers are loosely held open so the dirt can penetrate all the way to the skin to clog the breathing of any attached parasites and when the bird gets up and shakes after its dust bath, many of the parasites drop off.

### 14.1.8. Grooming

#### 14.1.8.1. Livestock

- a) Grooming is an important behavior for animals and that promotes health, calmness, well-being and overall performance.
- b) Grooming of animals is the act or process for animals to keep a healthy coat and skin by removing dust, dirt, manure, sweat, parasites and other contaminants from coat.
- c) Tongue is important in the grooming activities of many animals (cattle, sheep & goats) and they groom themselves and their herd mates by licking.
- d) The dairy cattle really want to be brushed, in fact, the cows are interested to access a brush as they are done to access fresh food, and when provided, 85 to 100% of cows in a herd used brush daily.
- e) Regular grooming in cattle improves cleanliness and appearance, increases blood circulation, and stimulates skin, which make the cattle coat shiny.
- f) Grooming improves milk production due to increased cow activity utilizing ketones on body reserve, and also improves udder health and decreases mastitis risk.
- g) Bathing and grooming in cross-bred cows under hot conditions may be an effective practice to obtain higher milk yield (up to 3.5%) with quality composition, to improve feed intake and to reduce heat stress during summer season (Verma, *et al.*, 2017).
- h) Grooming stimulates the blood and lymph flow in the skin, stimulates the nerves in the and prevents stress and skin disease.
- i) Grooming should be done 1 hour before milking so as all fine dust particles suspended in air may settle down.
- j) The hormone, prolactin is associated with grooming and has dopaminergic activity (activity that makes happy or feels relaxed) as grooming causes opiate induction and self-narcotization using prolactin pathway.
- k) Grooming is also a good opportunity for checking animal body for injuries, skin irritations or other health problems.
- l) Regular grooming will build trust and confidence between animals and their owners/handlers and develop a positive relationship between themselves during grooming.
- m) Grooming is considered a potential indicator of positive animal welfare.
- n) However, the grooming of livestock should be done with appropriate equipment, otherwise, it can be more damaging than benefit.
- o) Curry comb should be gently used on the bone points to avoid erosion on the skin, and not to irritate the hide.

#### **14.1.8.2. Poultry**

- a) Poultry and birds must groom its feathers with oil from the oil gland (also known as preen gland or uropygial gland) hidden under the soft feathers at the base of their tail.
- b) The aquatic birds including ducks need a lot of oil for waterproofing their feathers and a considerable amount of oil can be obtained from their most prominent oil gland located at the base of the tail.
- c) The preen oil produced from the preen gland of ducks is carefully distributed through the feathers or spread over every feather by the duck's bill.
- d) Loose feathers are pulled out, wrinkled and smoothed with preen oil that helps to insulate the bird, weatherproofs feathers, and keeps bills from becoming dry and scaly.
- e) Birds can preen as often as once an hour when they are at rest.
- f) The oil gland secretes clear, oily fluid with antibacterial and antifungal components, and pheromones.
- g) The oil gland produces a sebaceous material containing vitamin D precursors, which are converted to the active form of vitamin D<sub>3</sub> when exposed to ultraviolet light of the sun, and during preening, the active form of vitamin D<sub>3</sub> is ingested.
- h) The preen oil have anti-abrasive, anti-pollutant and pesticide effect.
- i) The preen gland is absent in amazon parrots, some pigeons and ostriches, and in doves.

#### **14.1.8.3. Importance of Animal (Livestock and Poultry) Grooming**

- a) At night, animals (livestock and poultry) may lie in manure, water or urine-soaked bedding or ground, and when this material adheres and hardens on the coat/hairs/feathers, it attracts flies and other insects that may transmit disease(s).
- b) Sometimes, the adherent material contains parasites such as hookworm, which can enter the skin and seriously affect the animal's health.
- c) When sweat evaporates, it leaves a mat of stiff hair resulting in a harness or yoke of the hairs leading the animal to rubbing against this mat will pull some of the loose hairs and harder clusters of hair will rub against the exposed skin that results in a burn or raw spot, which becomes increasingly tender and finally an open wound.
- d) These wounds are called girth sores or yoke galls causing pain and make animals extremely irritable and hard to handle.
- e) No birds need to groom as they groom them own, so only livestock need to groom.

- f) Regular grooming results in closer physical contact between owner/handler and animal that develops trust between them.
- g) Grooming allows the owner to learn about the animal's moods, sensitivities, and reactions, as a result the animal becomes familiar with the owner's/handler's voice, movements, commands, and becomes easier to handle.
- h) Regular grooming lets the owner/handler to take a close look at the animal each day.
- i) Minor problems like ticks, scratches, muscle strains, harness sores, and stones in the hoof can be detected and treated before they become serious problems.
- j) To groom animals, a person needs two tools-a curry comb and a brush- a curry comb is an oval shaped plastic or metal brushing device which is used to loosen sweat, manure and other materials from the animal's coat and the brush is used to remove the materials loosened during currying.

#### **14.1.8.4. Purposes of Grooming in Livestock**

Objectives/purposes of grooming in livestock are-

- a) Removing waste products like skin secretion, scurf and loose hairs, and dirt.
- b) Removing ectoparasites like lice, tick and other skin parasites from hair coat.
- c) Making hair coat clean, glossy and pliable.
- d) Massaging muscles and stimulating the cutaneous circulation of blood and lymph.
- e) Managing itching on skin, and making cleaner, calmer and more docile & comfortable.
- f) Preventing spread of skin diseases.
- g) Removing the dung from the hooves, interdigital cleft, interdigital space, sole of the foot and from the fuller of the shoe, and it is important to prevent small stones adhering to the dung and causing injury to the hoof.
- h) Helping in sanitary milk production in livestock.
- i) Observing abnormalities on the body, if any, by close inspection during grooming.

#### **14.1.8.5. Grooming Equipment and Types of Grooming**

- a) There are many types of grooming equipment in the market- some are made of pliable plastic, some of them metallic while other are wooden.
- b) Basic grooming tools are a comb, brush, sponge, scraper and grooming cloth.
- c) Cattle show big variation in response to grooming equipment, and some of them have greater sensitivity than others to grooming.

- d) All cattle age groups, whether in the pastures or barn, want to relax and scratch themselves and use many materials around them for this purpose.
- e) In the nature, cattle use trees and other abrasive surfaces to scratch areas of their body that are difficult to reach and groom themselves by licking, but the indoor cattle housing often lack appropriate grooming substrates restricts their ability to groom.
- f) If cattle cannot find other cattle to groom by licking in the controlled system, they will approach the walls, pipes, timber or similar things in the shelter to groom themselves.
- g) Friction on fence posts, sharp metal corners, rusty nails etc. in the housing can cause irritation, hair loss, abrasion and scars formation on animals' skins.
- h) For this reason, many companies have developed brushes for grooming systems to relieve animals and make them available in the market.
- i) These brushes are mounted in a stable place with a suitable height and inclination in the barn, and the cattle come to the side of the brush and the brush gently starts to rotate when he/she starts rubbing.
- j) There are generally two types grooming for cattle- manual and mechanical grooming.
- k) Manual grooming is a time-consuming and labor-intensive task and for this reason, mechanical grooming has been developed providing automated mechanical brushes.
- l) Mechanical brushes have many different types for different purposes, some types contain massage fluids, which protect cattle skin and protect against some parasites.
- m) The brushes are designed to protect against dust and water and is made of long-lasting plastic with softness that will not irritate or injure the animal, but maintain the optimum massage effect on cattle.
- n) The mechanical brushing system comprises of an L-shaped adjustable support frame for wall or pole for mounting, a support spring between the frame, a vertical brush contacting the animal, and an electric motor.
- o) The brush will be mounted in a suitable place in the barn, and when the animal comes to contact the brush, the brush will start to rotate slowly, smoothly and comfortably and work in such a way that it can move around the body of the cattle in response to the animal moving.
- p) Generally, the grooming brush length is maximum 75 cm and it can brush up to the head, neck and body of the animal, although this cannot work on the lower parts of the thigh and abdomen, and tail.
- q) There are 3 types of mechanical grooming brushes for cattle in the world market-

(1) Stationary brushes-

(a) Stationary brushes consist of a horizontal brush and a vertical brush and some models have a specific pattern to be adjustable on the size of the cattle.

(2) Rotating brushes-

(a) Rotating brushes have a brush that rotates on a horizontal arm attached to a motor which swings left and right at 45° angle that can be easily attached to wall or a support, and starts immediately when touched by cattle.

(b) The brush is controlled by microprocessors, and stops automatically in a few seconds after the cattle walk away.

(3) Swinging brushes-

(a) Swinging brush swings freely in all directions, smoothly up, over and alongside the cow and starts rotating when the cow pushes the brush and continues to rotate until it remains vertical for a period of time.

**Notes:** The Procedure of Grooming in Livestock has been described in Appendix 45.

#### **14.1.9. Exercising of Livestock**

- a) Exercise of animal means quietly moving them around so they get used to everything and the ultimate goal of exercise is to keep the animal normal and healthy.
- b) Daily exercise helps dairy cattle to reduce effects of heat stress and exercise is most necessary, especially for male breeding stock.
- c) Exercise keeps animal thrifty and active and helps normal body metabolic processes.
- d) However, it is advisable to avoid yelling and prodding during exercising animals.
- e) Just how much exercise is necessary for dairy cattle and buffaloes are not known, but in many instances, cows have been kept confined for long periods with little or no apparent physical and physiological harmful effect, although some physical activity is beneficial and certainly not harmful to dairy animals.
- f) Too much standing at one place weakens the leg muscles, causes the toes to overgrow and puts abnormal stress on legs and feet in case of cattle, and only exercise may offer relief from these conditions.
- g) Exercised cattle have increased body weight gains, reduced respiratory morbidity, shorter recovery times, decreased prevalence of dark cutters (meat that does not brighten when cut and exposed to air), and improved emotional attitude compared with nonexercised cattle.

- h) Exercise may be most effective during increased stress (e.g., weaning, arrival in feed yard), and for positive effects on milk production in dairy cattle.
- i) Out-door exercise with exposure to sunlight is important in providing vitamin-D.
- j) Exercise may induce lipid mobilization and use prior to delivery and therefore allow metabolic adaptation of cows prior to initiation of milk production.
- k) Exercise reduces the risk of excessive accumulation of triglycerides in the liver after delivery, especially in cows with a high body condition score in the dry period.
- l) Exercise for the herd is not a problem in loose housing system, but cows should be allowed to open lot or to a pasture at least once and preferably twice daily in case of confined system and that will allow the barns to clean easily and to dry quickly when the cows are away from the barn.

#### **14.1.10. Broody Control in Poultry**

- a) Broodiness is a natural tendency of birds and is observed in all hens and other female birds including duck that makes them to sit for brooding and hatch a clutch of eggs.
- b) But the intensity of broodiness varies species to species, individual birds and the presence of eggs in the nest.
- c) The actual cause of broodiness is still not known, but it is speculated that broodiness is a combined effect of hormones, instinct and maturity of the female birds.
- d) In warmer climates, broody hens should be looked for (search for) no later than 10 days after the onset of production.
- e) In the winter, broody hens should be started to looked for (search for) no later than 14 days after onset of production.
- f) Should be aware that hens sitting in the dark house may start production earlier and may need to be identified and put to a broody treatment sooner.
- g) Symptoms of broody hens that are as follows:
  - 1) Hens become harder to move off the nest.
  - 2) Lay pattern shifts toward the end of the day.
  - 3) Number of hens in the nest at the end of the day increases.
  - 4) Oviduct found smaller and paler at insemination.
  - 5) Production starts to decline.
  - 6) Feed consumption starts to decline and the flock becomes less active.
  - 7) A tendon forms between the pubic bones pulling the bones closer together.

- h) Broody female can be identified by visual observation of their broody symptoms.
- i) But there are many ways to identify broody hens, among these the 'paint and pull' method is a successful method and the procedure of the 'paint and pull' is as follows:
  - 1) Mix food color into a plastic spray bottle.
  - 2) Allow the hens 20 minutes to return to the nests after the first collection.
  - 3) Then begin spraying the hens.
  - 4) It is recommended that a different food coloring should be used each day.
  - 5) Hens with the color of that day staying in nest must be taken for broody treatment.
  - 6) Allow 20 min for hens to get back to nests after last collection of the day.
- j) An important aspect of broody control is the identification and elimination of factors which encourage broodiness.

*Broodiness factor 1:* Presence of eggs in the nest over a period of time.

*Remedy 1:* 1a) Collect eggs frequently - at least every 45-60 minutes.

*Broodiness factor 2:* Hens laying or nesting on the floor.

*Remedy 2:* 2a) Begin training hens to the nest when they are placed in the lay barn.

Pick up any hens nesting on the floor and place them in the nests.

2b) The hens may be having difficulties entering the nest or there may not be enough nest space. Improve nest access and increase nest space.

2c) Round out corners and add more lighting, especially in the dark areas.

2d) Walk the floor frequently to move the hens, and pick up any floor eggs.

2e) Switch sides on potential floor broody hens or run them through the broody program.

*Broodiness factor 3:* High percentage of eggs laid on the floor at night.

*Remedy 3:* 3a) Items 1a, 2a and 2b above.

3b) Light entering the main pen from the broody pens or other source.

*Broodiness factor 4:* High number of hens in nests at the end of the day.

*Remedy 4:* 4a) Switch side late layers.

## CHAPTER XV

# ANIMAL PRODUCT HANDLING, PREPARATION, PROCESSING, MARKETING AND FOOD SAFETY

### 15.1. Animal Product Handling and Preparation

#### 15.1.1. Egg Management (Table eggs)

##### 15.1.1.1. Minimum Standard of Table Eggs

###### *15.1.1.1.1. Minimum Requirements for Intact or Unbroken Table Eggs*

Intact or unbroken table egg should meet the following requirements:

A table egg should-

- a) be fresh and free from dirt;
- b) be clean, and free from visible cracks
- c) be normal in shape;
- d) be free from foreign odors;
- e) be free of visible mold;
- f) not be cloudy;
- g) be free from undesirable and hazardous residues (antibiotic, pesticides and hormones residues, heavy metals and radioactive substances);
- h) be free from Salmonella spp. pathogenic E. coli and Campylobacter spp.

###### *15.1.1.1.2. Minimum Requirements for Broken-Out Table Eggs*

A broken-out table egg should have following characteristics-

- a) The yolk should not be attached with the inner shell;
- b) The yolk having normal and consistent color;
- c) The yolk should be firm and surrounded by the thick egg white;
- d) Not be an incubated egg and
- e) Not be an embryonated egg.

##### 15.1.1.2. Handling, Preparation and Management of Table Eggs

Table eggs should be handled during all stages of collection, cleaning, sorting, grading, packing, storing and distribution in a manner that avoids damage, minimizes moisture on the shell surface and prevents contamination.

**15.1.1.2.1. Egg Collection and Sorting**

- a) Egg collection workers should sanitize their hands prior to handling eggs and between handling floor eggs, nest/cage eggs and eggs on the conveyor belt.
- b) Eggs found to be cracked, defective and/or dirty should be identified, correctly sorted, and packed for proper disposition, but the extremely dirty eggs should be discarded.
- c) All eggs collected from the floor should be placed in separate trays and labeled.
- d) Eggs should be collected in an easy to clean container like coated wire baskets or plastic flats to prevent stains from rusted metal and contamination from other materials.
- e) If egg collection equipment is used-
  - 1) The collection equipment should be made of materials that are non-toxic and be designed, constructed, installed, maintained and used to facilitate good hygiene.
  - 2) Egg collection equipment and containers should be cleaned and disinfected regularly, if necessary, replaced to minimize or prevent contamination of eggs.
  - 3) The equipment should be kept in proper working condition & periodically verified.
- f) Collected eggs should be held below 15°C with 70% humidity prior to cleaning avoiding temperature fluctuation that will cause sweating (condensation of water) on egg shell.
- g) Eggs must never be cooled rapidly before cleaning that will allow eggshell to contract and may pull any dirt or bacteria on the egg surface into the pores when cooled.

**15.1.1.2.2. Egg Cleaning and Decontamination**

- a) Dirty eggs should be properly cleaned and marketed as table egg or sent for processing.
- b) Broken/leaker and other inapt table eggs should be identified and disposed suitably.
- c) A cleaning process should be used to remove fecal materials, debris, bacterial load and other foreign matters on the outside of the shell.
- d) Cleaning should be carried out under carefully controlled conditions so as to minimize damage to the shell surface.
- e) Table eggs could be cleaned either by using dry cleaning or wet cleaning method and also be decontaminated by pasteurization.

**A. Dry Cleaning**

- a) Dry cleaning is generally carried out in small farms producing a small number of eggs.
- b) A slightly dirty egg can be brushed with an egg brush or rubbed with a sanding sponge, loofa, paper towel and plastic scourer (if stained) with a gentle rubbing motion.
- c) Disposable paper towels are recommended to avoid reuse, if dry cloth or any other is used for cleaning, it must be clean and sanitized and be suitable for contact with food.
- d) Any brushes, cloths, loofas, etc. used in cleaning should be sanitized in 100 ppm of chlorine for 20 minutes after use.
- e) Materials used for cleaning eggs should be food grade and must not be used for any other purpose.
- f) Sanding blocks should not be used as they are not made to be used with food and loose grit could be left on the egg.
- g) Eggs with visible feces, soil or other matter that cannot be removed by dry cleaning should be segregated away from clean intact eggs and kept for cleaning with damp cloth or disposed of hygienically.
- h) If dirty eggs are cleaned with damp cloth, certain precautions must be taken-
  - (1) the water used to dampen the cloth should be sanitized and frequently changed,
  - (2) detergents and sanitizers used must be suitable for contact with food and used according to the manufacturer's specifications,
  - (3) damp cloth should be rinsed adequately in sanitized water & squeezed thoroughly so it is not dripping before being used,
  - (4) damp cloth should not leave water droplets on the egg when passed over the egg,
  - (5) only a thin layer of moisture that can readily evaporate should be left on the egg,
  - (6) damp cloth supply should be adequately available and changed frequently when any sign of soiling is visible, and
  - (7) dirty cloths should be washed, sanitized and dried, if they are reused for cleaning.
- i) Dry cleaning method should follow process to minimize damage to protective cuticle.
- j) Where eggs are treated to eliminate pathogens, the treatment should not adversely affect the safety or suitability of the egg.
- k) Approved sanitizers include: Chlorine, Potassium hydroxide or sodium hydroxide (lye), Sodium carbonate, Hydrogen peroxide, Peracetic acid—a mixture of vinegar and hydrogen peroxide.

## B. Wet Cleaning (Egg washing)

- a) Egg shell is porous, but the Almighty designed it to have a micro membrane coating on it, called “bloom” (a waxy cuticle) to protect the inner mass of the egg from harmful microorganism and to keep it safe and clean.
- b) Washing egg removes the bloom and invites microorganism to be drawn inside the egg.
- c) As an egg shell has 6,000 to 8,000 pores through which harmful microorganism can enter into the inside of the egg, even the shell appears clean, which demands egg washing, but even so, eggs do not need to be washed.
- d) However, the large egg producers are washing eggs, although washing can increase the public health risks associated with the handling and eating of eggs, if not done properly.
- e) If eggs are washed, eggs should be washed as soon as they are collected to avoid the growth of microorganisms, particularly on cracked and dirty eggs.
- f) Washing should be carried out under carefully controlled conditions so as to minimize damage to the shell and prevent contamination to the egg.
- g) Egg washing could be carried out with only water, and also with water and sanitizer.
- h) Water used for washing should be potable with correct quality, temperature and pH.
- i) Warm to hot water causes the egg contents to expand which helps prevent bacteria from being pulled in through the pores, while colder temperatures will cause egg contents to contract and pull in any bacteria on the shell surface.
- j) Very high pH ( $\geq 10.5$ ) of the egg washing water will kill *Salmonella* on the eggshell.
- k) Eggs washing involves 5 stages: pre-washing, washing, sanitizing rinsing and drying.
- l) The temperature of the pre-wash water should be at least  $11^{\circ}\text{C}$  higher than that of the eggs and a minimum of  $3^{\circ}\text{C}$  lower than that of the wash water.
- m) Temperature of wash water should be at  $41^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , sanitizing water be at  $45^{\circ}\text{C} \pm 3^{\circ}\text{C}$  and that of rinse water be at  $49^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , and if using an egg washing chemical or sanitizer, the pH should be  $\geq 10.5$ , but the wash water of any stage must be not reused.
- n) If the egg washing is accompanied with sanitizer, manufacturers’ recommended concentration and pH for the sanitizer must be followed.
- o) As the rinsing procedure removes the residue of any chemicals including the sanitizer used and loose dirt adhering to the surface of the shell, it should be done properly.
- p) If the washing is carried out using water with appropriate temperature without any chemicals, the normal pH of the water is acceptable.

- q) Washing with only water (without using chemical) may be followed by use of an effective, food grade and approved sanitizer with recommended dose, but is optional.
- r) The washing process should be rapid and continuous at all stages of washing so that eggs are not allowed to stand or soak in the pre-wash, wash, sanitizing and rinse water that will increase the risk of entrance of microorganisms into the egg.
- s) The washed eggs should promptly and thoroughly be dried immediately after rinsing using high-speed airflow to evaporate water rapidly from the shell surface.
- t) Egg washing should be undertaken in a dedicated pest free room with good drainage, and a recognized pest control program should be in place to ensure food safety of eggs.
- u) Various commercial instruments are available for egg washing, sanitizing and drying.
- v) Immersion egg washers are not prohibited however, it is not encouraged to be used to mitigate the risk of potential egg contamination, but brush and spray washers are ideal instruments to be used in egg washing.
- w) All egg washing and processing equipment should be thoroughly cleaned and sanitized before using to prevent the accumulation of egg material and microorganism.
- x) If the washed eggs carry fecal matter or other visible contaminants on the shell, these eggs should be discarded.
- y) The temperature, chemical concentration and pH of the water at all stages of the washing process should be recorded for each batch of eggs washed.

### **C. Pasteurization of Eggs**

- a) Recently, the eggs are pasteurized in a limited scale in some developed countries using an approved process to ensure egg food safety.
- b) Pasteurization of eggs is carried out by gently heating the eggshell using controlled temperature (60°C) and time (3.5 minutes) to completely kill bacteria (especially *Salmonella*) that might be present on eggs without cooking it.
- c) The pasteurization process protects public health from dangerous foodborne illnesses, most notably salmonellosis.
- d) Like all other eggs, pasteurized eggs must be kept refrigerated to maintain their quality and may be used within 3 to 5 weeks.
- e) Pasteurized eggs are specially used in preparing recipes with raw or undercooked eggs, or feeding young kids, pregnant women or the elderly.

**15.1.1.2.3. Egg Storage, Packaging, Transportation and Record Keeping**

- a) Table eggs should be transferred between the establishments (laying house to cleaning room/area, cleaning room/area to egg storage) promptly.
- b) Plastic egg trays/flats should be cleaned and sanitized after each use and the carton egg trays/flats should be disposed appropriately after use.
- c) All eggs should be stored in a clean, dry, well-ventilated and cool area after sorting with their broad pole uppermost.
- d) Table eggs should be maintained at a suitable temperature between 5°C and 15°C avoiding temperature fluctuation that will result in sweating on egg shell.
- e) When table eggs are stored, it should be in a manner that minimizes damage to the eggshell and avoids introduction of contaminants or growth of existing microorganisms in or on table eggs giving consideration to time and temperature conditions.
- f) Eggs should not be stacked too high, not more than 5 layers deep in baskets, not more than 6 vertical flats in plastic flats and, not more than 4 vertical flats in carton flats.
- g) Where permanent equipment is used, it should be corrosion-resistant and easy to clean and disinfect, if necessary be able to be dismantled and reassembled.
- h) Egg packaging equipment should be designed, constructed, maintained and used in a manner that minimize damage to the eggshell and avoid introduction of contaminants in or on table eggs.
- i) Eggs should be transported in proper registered vehicles (refrigerated or ventilated).
- j) Egg transporters (driver/individual in charge of transport) should use vehicles suitable for transporting table eggs, which permit easy and thorough cleaning.
- k) Eggs should be delivered to the destination as quickly as possible to maintain freshness.
- l) Eggs should be transported that will minimize breakage, damage and contamination.
- m) Vehicles, tankers and containers should be cleaned and disinfected before refilling.
- n) Records of eggs collected and sold/shipped should be kept and maintained properly.

**15.1.2. Milk Handling and Management**

Milk management includes milking and milk management.

- a) Proper and appropriate equipment and tools for milking should be provided.
- b) Appropriate hand milking procedure should be practiced.
- c) The milker should maintain right personal and cow cleaning and hygienic management.

- d) The milking equipment and tools must be kept clean & sanitized before and after use.
- e) Proper training should be provided to all milkers.
- f) Appropriate milking procedures should include-
  - 1) Equipment and utensils must be cleaned and disinfected before and after use,
  - 2) Pre-milking teat cleaning and washing up to the base of the udder with an effective and approved sanitizing solution for 30 seconds,
  - 3) Stripping of foremilk before milking,
  - 4) Wiping dry the teats and udder with individual towels,
  - 5) Establishment of milking unit for machine milking or hand milking,
  - 6) Post milking disinfection of each teat up to the base of the teat with an effective teat disinfectant (preferably Iodine-based teat products) regularly and
  - 7) Animals having mastitis must be milked last.
- g) There should be chilling and storage facilities for the immediate post-harvest handling of milk, and maintained at the proper temperature.
- h) Individual cow owners and smallholders, those who do not have chilling facility, should transfer their milk to the nearby milk collection/chilling center, if any, or they should either sale or boil the milk as early as possible after milking.
- i) Milk should be drawn from animals that do not show any evidence (signs or analytical results) of infectious diseases caused by human pathogens that are transmissible to human through milk including but not limited to such disease governed by WOAHS Terrestrial Animal Health Code.
- j) Milk should randomly be tested for color, odor, physical agent, specific gravity etc., and have provisions and protocol of testing and certification on quality of milk from the DLS approved laboratories.
- k) The animals must be officially free of brucellosis, tuberculosis, and leptospirosis, as evidenced by annual testing/screening by the accredited laboratory based on the order of the competent veterinary authority.
- l) If not officially free, then milk should originate from herds or animals that are under official control and eradication programs for brucellosis and tuberculosis.
- m) Milk must be transported by using a cool van with the van temperature at 2-4<sup>0</sup>C.

### **15.1.3. Meat Handling, Preparation and Management**

#### **15.1.3.1. General Guidelines**

- a) Animal slaughter and meat processing shall be performed in compliance with provision and rules of 'The Animal Slaughter and Meat Quality Control Act, 2011' and 'The Animal Slaughter and Meat Quality Control Rules, 2021' of Bangladesh.
- b) Animals (Poultry and livestock) shall not be slaughtered outside the slaughter house, meat selling center or meat processing plant recognized by Government of Bangladesh except that to be slaughtered in case of festival sacrifice in the 'Eid ul Azha' and that required for family needs.
- c) The livestock and poultry that are to be slaughtered must be healthy, with normal behavior and free from disease, and that be eligible for slaughter.
- d) The livestock and poultry that are to be slaughtered shall be kept at rest for at least 6 and given only potable safe water, but no feed for 12 hours prior to slaughter.
- e) Body of the animal that is to be slaughtered shall be cleaned properly before slaughter.
- f) No animal shall be slaughtered in front of other live animal(s)
- g) After ensuring the death of the slaughtered animal, further processing shall be started.

#### **15.1.3.2. Slaughterhouse, Meat Selling Center and Meat Processing Plant Establishment**

- a) Slaughter house, meat selling center and meat processing plant shall be established subject to obtain the license from the DLS, Bangladesh according to the respective provisions of the 'Animal slaughter and meat quality control Act, 2011'.
- b) Slaughter house, meat selling center & meat processing plant (may called as 'facilities' in this section) shall be established for slaughtering animals, preparation & processing of meat respectively for commercial purposes and compliance with followings:
  - 1) The facilities shall be separated from the place of animal rearing and keeping.
  - 2) The facilities shall be at higher place, but not near any water body like river, canal, haor, bil, water land, flood land, waterfall, lake, pond etc. in order not to drain the liquid wastes (waste water, blood etc.) to these water bodies.
  - 3) The facilities shall be designed and constructed with at least 3 rooms in such a manner that the meat and carcass shall not be contaminated with hazardous microbes anyway, and the meat shall be supplied with one directional way from the red zone (slaughtering, carcass examination and washing room) to the yellow zone (meat preparing/processing room where temperature shall be at 2-4<sup>0</sup>C), then to the green zone (meat cutting and packaging room).

- 4) The facilities shall be protected by wall and roof with adequate aeration and lighting inside, and with tolerable internal temperature.
- 5) The wall of the facilities shall be smooth and be allowed to be cleaned with water.
- 6) The floor of the facilities shall be made hard, smooth and impervious with slope to the drainage, and free from wet, filthy and slippery conditions.
- 7) The facilities shall have clean water storage and cool and hot water supply facilities.
- 8) The carcass, offal and the wastes obtained from slaughtered animals must be kept separately and the animal shall not be slaughtered in the place of offal and wastes.
- 9) The facilities shall have air tight containers for keeping diseased viscera and their parts and leak proof containers for other wastes, and have the facility to disinfect all the equipment and appliances that are used in the facilities.
- 10) The facilities shall have quality control personnel and qualified laboratories of their own for ensuring the meat quality.
- 11) The personnel working in the facilities should be well trained and refreshed from time to time attending the refreshing training courses.
- 12) The personnel engaged in slaughter and meat processing activities shall be healthy and free from all contagious diseases, shall wear light color washable dress and maintain strict personal hygiene, and shall not move from one room to another room of the facilities during ongoing activities.

**15.1.3.3. Slaughter, Examination, Production, Preservation and Transport of Meat etc.**

- a) The slaughter of animals shall be performed in the name of the Almighty using sharp stainless-steel knife by to and fro motion of the knife to ensure the cutting of the trachea and esophagus, and at least any three of two jugular veins and two carotid arteries (any 3 out of these 4 blood vessels) of the animal for 'Halal Meat' production.
- b) The slaughtered animal must be allowed to struggle enough on the floor for complete bleeding in 'Halal Meat' production.
- c) Hence, for 'Halal meat' production, automatic slaughter equipment that do not allow the slaughter animal to struggle enough for complete bleeding shall not be used.
- d) The animal that to be slaughtered shall be examined by a Registered Veterinarian for its healthiness before slaughter, then after slaughter and skinning for the presence of any lesion, and finally to be sure that the meat is fit for consumption.
- e) Slaughter house surveillance, sampling and testing for important zoonotic diseases like bovine Tuberculosis (bTB), Bovine Spongiform Encephalopathy (BSE), Transmissible Spongiform Encephalopathies (TSEs) etc. should be in place.

- f) Good sanitary and hygienic measures must be taken during slaughter, preparation and processing of meat in the facilities.
- g) The meat obtained from slaughtered animals should be sold as fresh meat, otherwise be cooled at 0-4°C to sell for 3-5 days or at least at -18°C to sell for 4-12 months.
- h) As the head, neck, heart, liver, gizzard, lung, legs and skin of the slaughtered birds, and the head, heart, liver, lung, legs and hooves, cleaned and processed parts of viscera (rumen and omasum) of the slaughtered livestock can be used as human and animal foods, so they should be properly cleaned and processed and be sold as fresh or frozen to sell as per instructions mentioned in the clause (g).
- i) Freezing meat above –18°C, it can be discolored and lost its vitamin content.
- j) Transportation of carcass(es) and meat from one place to another shall be performed hygienically by disinfected cool van with temperature at 2-4°C and also be disinfected after transport.

#### **15.1.3.4. Waste Management**

- a) The waste management of the facilities shall be in compliance with respective rules of 'The Animal Slaughter and Meat Quality Control Rules, 2021' of Bangladesh.
- b) The offal that cannot be used as food, internal wastes of viscera and other wastes generated from slaughtering like blood, body fluids etc. shall be disposed under the earth in deep burial method in the places designated by the local authority (city corporation, municipality or union parishad) or in a far distance from the facility with own arrangement of the facility authority.
- c) The solid wastes generated during the selling and packing of meat shall be kept in the leak proof containers in a safe place apart from the meat preparation, processing and selling areas of the respective facility and disposed within 6 hours of deposition.
- d) The wastes shall be transported for disposal in the last period of night before the peoples coming out the roads for their needs.
- e) The blood and other liquid wastes could be disposed to the internal drainage from the respective facility, but care must be taken not to enter into the water bodies like river, canal, pond etc.
- f) If possible, the facility could establish an effluent treatment plant (ETP) to dispose and treat the liquid wastes including blood generated in the facility.

## **15.2. Processing and Marketing of Animal Products**

### **15.2.1. Eggs**

#### **15.2.1.1. Egg Processing, Packaging and Labeling**

- a) At the farm or producer level, eggs are generally not processed for value addition in Bangladesh and are sold or supplied as fresh eggs.
- b) Egg should be graded according to its size or weight possibly into 3 or 4 grades, although eggs are still not graded in Bangladesh.
- c) Eggs should be packed in egg tray or cartons or suitable containers that will avoid causing any external or internal damage to the eggs
- d) The packaging material may be standard plastic tray or disposable paper cartons molded to suit the size of the eggs.
- e) Eggs should be packed either in new carton or plastic tray with their small ends facing down, but in case of reuse the plastic tray should be disinfected and dried before reuse.
- f) Eggs in each package should be uniform in size.
- g) The packaging should meet the quality grades, hygiene requirements and be free of any foreign matter and smell.
- h) The packaging should be durable against handling, transporting and maintaining eggs.
- i) Egg package should be labelled with the brand name (if any) and the date of production.

#### **15.2.1.2. Egg Marketing**

- a) Eggs should be sold or supplied to market within 7 days and preferably 3 days of production to maintain their quality in the hot and humid climate of Bangladesh.
- b) However, the selling price of eggs is critical for the producers to obtain logical profit.
- c) The producers should sell eggs directly avoiding the middle man to ensure their profit.
- d) The producers should maintain a market network to get on time updated information of price and the demand of eggs.
- e) It may be helpful for a producer to market eggs, if he comes into contract with the wholesale shops super shops, big hotels and/or restaurants near his production unit.
- f) The egg should be transported by light vehicle keeping eggs in the carton and/or plastic trays ensuring that the vehicle is reliable, the vehicle staffs are responsible and mishap of eggs will occur consciously until the luck disfavors.
- g) The vehicle staff must drive and maintain the vehicle, and handle the eggs (load and unload) keeping in mind that they are carrying fragile eggs, if any mishap occurs, the eggs will be ruined and the respective person(s) will incur a heavy financial loss.

## **15.2.2. Milk**

### **15.2.2.1. Milk Processing, Preservation, Packaging and Marketing**

- a) Generally, the producers sell their produced milk in the local markets as fresh milk to the retailers and wholesalers as per daily production basis in Bangladesh.
- b) A few producers sell their milk in the collection center of the processing plants.
- c) As the milk is a perishable product, it cannot be kept for a long time as fresh, as a result the producers are compelled to sell it on time at any price that falls their profit at risk.
- d) However, milk can be pasteurized and to market for a longer period of time, although milk can be frozen for a while, but the clients don't like non-pasteurized frozen milk as the milk fat is generally separated when the fat content is higher (>3%) during freezing.
- e) A few milk-producing and/or -processing enterprises are marketed their milk following the standard and procedures of Bangladesh Standard and Testing Institute (BSTI), either in pasteurized packet form or as fresh milk.
- f) Hygienic production and pasteurization of milk should be encouraged for food safety.
- g) In Bangladesh, some producers and/or processors pasteurized milk using HTST (High Temperature Short Time) method where milk is heated at least at 71 °C for no less than 15 seconds or at 62°C for 30 minutes followed by rapid cooling, and some of them are using UHT (Ultra High Temperature) method where milk is heated to 138 °C for at least two seconds, then rapidly cooling it down.
- h) In case under developed communication system, chilling centers should be established to increase the shelf-life of milk and to ensure logical and profitable price of milk.
- i) The collection center of the pasteurization plant can collect milk from the household milk producers and smallholder dairy farmers that will ensure the logical price of the milk of household producers and smallholder dairy farmers.
- j) The milk collected and pasteurized under the cooperative system can be sold in the market and the respective producer will get their price share accordingly that will encourage peoples to come forward to rear dairy animals and to establish dairy farms.
- k) However, at least the cooperative based milk collection and pasteurization rather than the cooperative based milk production is a demand of the time to ensure milk supply to the maximum peoples of Bangladesh.
- l) The Government of Bangladesh should take initiative to establish such pasteurization plant in the areas of milk potential and poor communication to encourage the milk producers by ensuring the market of milk leading to self-sufficiency in milk.

### **15.2.3. Meat**

#### **15.2.3.1. Meat Processing, Preservation, Packaging and Marketing**

- a) Like milk, meat is also sold in the local markets as fresh meat to the retailers and to some extent to so called big customers like some hotels and restaurants under the daily animal slaughter basis in Bangladesh.
- b) The marketing system of meat is the individual basis animal slaughtering and preparing of meat for selling in the meat shops in different markets and places of Bangladesh.
- c) However, almost all the super shops are selling frozen meat like poultry meat/carcass, beef and mutton, and some are selling dividing meat into different categories like drumsticks, wings etc. of poultry, and thigh meat, loins meat etc. of other animals.
- d) Some meat sellers are preserving their meat to sell further at low temperature for a period of time, generally for 12-24 hours, if they do not sell the meat in a day.
- e) But, the piece size and the preserving temperature of the meat are raising questions of its proper preservation.
- f) However, the meat sellers generally preserve their meat keeping it in larger piece size, such as whole thigh, whole fore leg, whole or half brisket etc.
- g) The temperature should be very much low, below the freezing point, to preserve the inner tissues of the heavy muscled part of the carcass, like thigh.
- h) However, preservation of meat should be done by cutting the meat into small pieces or even into moderately larger pieces that weighing about 2-5kg, which will help to preserve the meat correctly by reducing the temperature of the meat rapidly.
- i) Generally, there is a few processing systems of meat in Bangladesh prior to cooking it, except a few poultry producers are processing their poultry meat in their own poultry processing plants by producing some value-added products like meat ball, nugget etc.
- j) However, a variety of value-added products like beef kabab, beef pepperoni, beef roast, steak beef, beef keema etc. could be produced from beef and that are producing in Bangladesh by a limited restaurant, hotel and a few processing plants.
- k) However, the year-round beef cattle producers can come into contract with potential meat sellers and big meat consumers like big hotels and restaurants of their locality and even in their district towns that will help the producer to ensure his beef market to maintain a steady flow of production.

### **15.3. Food Safety of Animal Products (Egg, Milk and Meat)**

#### **15.3.1. Present Food Safety Situations of Animal Products in Bangladesh**

- a) Food safety is now a big challenge in Bangladesh irrespective of food types, sources, origin, conditions (fresh/preserved/processed), location and marketing system of food.
- b) The same frustrating situation is also predominant in Bangladesh in case of animal products (egg, milk and meat) that are the main source of animal protein, of which egg and milk are called 'Complete Food' for human beings, especially for children.
- c) Some producers, middlemen, retailers and/or some other stakeholders may become habituated to adulterate these products to get more profit and/or to attract the clients.
- d) The types and form of adulterations and forgery with the customers vary time to time and location to location, such as,
  - 1) White color eggs are made brown colored using hazardous dyes (e.g., textile dyes that can cause cancer) with a view to-
    - (a) attract the customers, as some customers like the brown color eggs more than the white color eggs and/or
    - (b) earn more profit, as sometimes the price of the brown color eggs become more than that of the white color eggs.
  - 2) However, these hazardous dyes can enter into the egg through the porosity of the egg shell, in the long run, that can cause serious public health problems like cancer.
  - 3) Milk is adulterated in many ways to earn more profit doing forgery with the clients-
    - (a) Most common adulteration is the addition of water to raise the volume of milk.
    - (b) Addition of low-cost powder milk or skimmed milk in combination with water to increase the volume and total solids of milk in order to maintain the normal concentration of milk.
    - (c) Addition of hazardous dyes to milk to make it attractive (light yellow color) and to show that the milk contains a higher percentage of fat.
    - (d) addition of alkaline salts like sodium bicarbonate to increase the keeping time of milk as normal.
  - 4) Meat is adulterated by rubbing edible oil generally mustard oil or occasionally soybean oil or sometimes non-edible oils like vehicle lubricant oil like Mobil on the surface of the large meat piece to be seen glistening as fresh meat.

- e) Other than the above situations, the microbial load with harmful organisms in the animal products is a serious concern about their food safety standards.
- f) However, it has been reported that about 40% samples were contaminated with *Salmonella spp.* and about 30% were found contaminated with *Staphylococcus spp.* in the meat samples collected from the slaughterhouses of the Dhaka South and North City Corporation areas (Murshed, 2014).
- g) Additionally, hygienic production and marketing of the animal products are still alarming, especially in case of milk and meat production, preparation and marketing.
- h) Outside the city corporation and some municipality areas, cattle buffaloes, goats and sheep are slaughtered in open places where there is no adequate facilities of water and sanitation, and their meat are prepared at the selling shops of the market or roadside without following any hygienic and sanitary measures.
- i) Poultry are slaughtered and their meat are prepared mainly in the live poultry selling shops in the urban markets without maintaining any hygienic and sanitary measures.
- j) Some of the retailers sell poultry at the doorstep of the customers as mobile poultry sellers by ferrying, and slaughter poultry and prepare the meat on roadside ignoring all hygiene and sanitation, which may be due their lack of knowledge on these issues.
- k) In the rural markets, there are some live poultry selling shops where the shop keepers slaughter poultry and prepare their meat following no hygienic and sanitary measures, although the maximum poultry are slaughtered and prepared the meat at the kitchen of the consumers in the rural areas.
- l) These unhygienic slaughtering and preparation of meat without following any sanitary rule can cause a higher load of harmful organisms and contamination of hazardous chemicals like heavy metal, pesticides etc. that can cause serious public health risks.
- m) Side by side, meat and milk from diseased animals, especially milk from the mastitis affected (clinical or subclinical mastitis) animals involve the supply of contaminated meat and milk with harmful and even with antibiotic resistant organisms.
- n) Marketing of meat, milking and eggs from apparently healthy animals that have received antibiotics and/or other drugs and have not observed the withdrawal period prior to slaughter, milking and egg collection may lead to contamination of antibiotic and/or other drug residues, and antibiotic resistant bacteria in the meat, milk and eggs, which may develop serious public health problems including antimicrobial resistance.

- o) However, all types of animal products that with adulteration, heavy load of harmful organisms and chemical contaminations, and without adulteration, low or acceptable load of harmful organisms and chemical contaminations are marketed in Bangladesh, so the consumers do not have any alternative to escape from these alarming situations.
- p) There is inadequate routine testing or monitoring system in Bangladesh for the animal products at the production, preparation, processing or marketing levels to ensure their quality, although some authorities are sporadically monitoring the quality of the animal products in the markets of the urban areas by conducting 'Mobile Court'.
- q) Bangladesh did not have an appropriately capable laboratory to evaluate the quality of egg, milk and meat until 2021.
- r) However, a 'Quality Control' laboratory is working in full swing under the DLS, Bangladesh from March 2021 achieving the ISO certification and accreditation from the Bangladesh Accreditation Board (BAB), Bangladesh.

### **15.3.2. Ensuring Food Safety of Animal Products from 'Farm to Fork'**

To ensure food safety of the animal products from 'Farm to Fork' the following steps should be taken by the farmer, stakeholders and authority.

- a) Rear and manage animals in a good environment with suitable housing and facilities, and with contamination free quality feed and water, proper feeding practices, good health management, and with proper biosecurity, hygienic and sanitary measures, and following animal welfare and good animal husbandry practices.
- b) Milking healthy animals following appropriate milking procedures, preserve milk at correct chilling temperature and pasteurize milk, if possible.
- c) Sell, supply or utilize milk as early as possible after milking, if pasteurization or chilling is not possible.
- d) Collect or procure actually healthy animals with good health records, having no history of discouraging disease and treatment records.
- e) Slaughter the animal, prepare, sell and process meat in compliance with the provisions and rules of 'The Animal Slaughter and Meat Quality Control Act, 2011' and 'The Animal Slaughter and Meat Quality Control Rules, 2021' of Bangladesh.
- f) Obtain fresh egg on laying day from the disease-free flocks of chickens and ducks that consumed chemical contamination free feed confirmed through traceability records.

- g) Clean, sanitize and pack eggs in contamination free packages for sale and supply.
- h) Sell, supply or consume eggs within 3 days of laying.
- i) Implement HACCP principles to the enterprises of production and processing of animal products, especially in milk and meat producing enterprises and processing plants.
- j) Ensure the quality of egg, milk and meat in an appropriate quality control laboratory, if any question or confusion arises about the quality of them.
- k) Form a quality monitoring and evaluation team on behalf of the competent authority at production, preparation, processing, preservation, transport, marketing and consumer levels for monitoring and evaluation of the quality of egg, milk and meat.
- l) Monitor and evaluate the quality of the animal products at production, preparation, preservation, processing, transport, marketing and consumer levels by the monitoring and evaluation team formed by the competent authority.
- m) Publish evaluation reports (quarterly/half yearly/yearly) on production, preparation, preservation, processing, transport, marketing and consumers of the animal products by the monitoring and evaluation team formed by the competent authority.
- n) Take necessary corrective measures for the respective enterprises that fail to comply with the NG-GLPP guidelines and other existing standards, Rules and Acts by the competent authority.
- o) Formulate, approve and implement the-
  - 1) code of standard for table eggs, milk and meat;
  - 2) code of animal health management
  - 3) code of feeds and feeding
  - 4) code of farm biosecurity
  - 5) code of farm hygiene and sanitation
  - 6) code of farm waste management and environment conservation
- p) Establish quality control laboratories (QC Lab) at the divisional level to facilitate the evaluation of the quality of egg, milk and meat.
- q) Regulate egg, milk and meat imports to keep market price at the level of encouraging profit for the actual producers that will result in involvement of quality entrepreneurs into the livestock production, processing and marketing sectors, who will produce quality animal products.

## **CHAPTER XVI**

# **ANIMAL WELFARE AND RESPONSIBILITIES OF ANIMAL ENTERPRISES**

### **16.1. Animal Welfare**

#### **16.1.1. General Guidelines**

- a) Animal welfare means the physical and mental state of an animal in relation to the conditions in which it lives and dies.
- b) Care shall be taken to preserve the welfare of animals and be maintained in compliance with 'The Animal Welfare Act, 2019' of Bangladesh.
- c) Animals having injury, sickness or deformity shall be correctly treated to avoid suffering.
- d) Animals should have access to and are sufficiently provided with feed, water and space.
- e) The owners/farm managers and personnel should not cause cruelty to animals, which includes but is not limited to:
  - 1) Maltreatment of animals under his/her care and attention.
  - 2) Neglect of animals, such that it experiences pain, suffering or distress.
  - 3) Failure to provide adequate resources to maintain the live weight of the animals within the normal physiological range for the species type, age and sex.
  - 4) Removal of any anatomical part without adequate anesthesia.
  - 5) Putting to sleep (euthanasia, e.g. cervical dislocation), confine, handle or transport any animal in a manner causing deliberate pain, suffering or distress.
- f) Keeping an animal alive, especially that which is apparent physically or physiologically harmed, unless it is under the direct care of a Registered Veterinarian.
- g) The animal owner/farm manager and personnel should not neglect animals on the followings-
  - 1) Freedom from hunger and thirst and malnutrition;
  - 2) Feed withdrawal of animals should not be more than specific hours before slaughter as per species complaint with 'Animal Welfare Act, 2019' of Bangladesh;
  - 3) Freedom from physical discomfort and pain;
  - 4) Freedom from injury and disease;

- 5) With due consideration to the differences in the production system (confined and free-range), animals should be given enough freedom to conform to essential behavior patterns, and
- 6) Freedom from fear and distress.
- h) Animals intended for slaughter shall follow the 'Animal Slaughter and Meat Quality Control Rules, 2021' for resting of animals prior to slaughter.
- i) Slaughter of animals shall be using humane slaughter method, preferably Halal method, which involves killing through a cut to the trachea, esophagus, jugular veins (at least one) and carotid arteries (at least one), and the animal must be alive and healthy at the time of slaughter, and the skinning process shall not be attempted until almost total blood is drained from the carcass.

#### **16.1.2. Animal Welfare on Handling and Restraining of Animal**

- a) Animals should be handled and restrained avoiding from fear, stress, pain and injury.
- b) Suitable kits and tools should be provided and used in handling and restraining animals.
- c) Appropriate tools should be used for the purpose of effective animal management and the managers should acquire the skills and techniques to use the tools.
- d) Proper techniques should be applied to handle and restrain animals.
- e) Tools should be used in a manner that minimizes stress and does not injure the animals.
- f) Tools should be functional for efficient application and be used in a manner that minimizes stress and does not injure the animals.
- g) Sick, injured or disabled animals should be separated from healthy animals and should be given the necessary veterinary attention (including euthanasia if required).
- h) Stick, cane or electric probes should not be used to restrain the farm animals. It may be used for the worker's safety when handling larger or aggressive animals.

#### **16.1.3. Animal Welfare in Poultry Hatchery**

- a) Hatchery should have a monitoring program for diseases endorsed by the authority.
- b) Baby birds should be handled in such a way that avoids injury and minimizes stress.
- c) All persons should be competent in looking after the health and welfare of baby birds.
- d) Rejected baby birds should be handled and disposed of in accordance with the 'Animal Welfare Act, 2019' of Bangladesh.

#### **16.1.4. Animal Welfare on Transportation of Animals**

- a) The transport of animals from point of origin to the final destination should follow a planned route and through the most direct and suitable route that should be done without unnecessary delay and/or break.
- b) Animals should be transported in a manner that does not cause stress throughout the journey and does not predispose them to injury and disease.
- c) Transport should follow the regulations of the competent authority.
- d) Animals being transported should be in a good state of health.
- e) Stressed, sick & pregnant animals may be transported but with extra-safety measures.
- f) Animals must be transported in suitable vehicles that provide comfort during the travel.
- g) Appropriate space and ventilation should be provided during transportation.
- h) Only clean and disinfected vehicles should be used to transport animals.
- i) Specially designed vehicles for each species should be used to transport animals.
- j) Vehicles should solely be used for transporting specific species and types of animal.
- k) Transport vehicles should comply with the requirements of the competent authority and should:
  - 1) Allow easy loading and unloading;
  - 2) Has communication equipment and first aid kit;
  - 3) Ensure safety of the animals and personnel during transport;
  - 4) Clean and sanitized;
  - 5) Equipped with floors that provide secure footing;
  - 6) Have proper provision for collection of manure;
  - 7) Have proper drainage for collection of urine;
  - 8) If needed, underloaded vehicles should provide partitions to avoid injury to animals;
  - 9) Have a label of “Live Animal on Board” (“জীবন্ত প্রাণী পরিবহন”) at sides, front and back;
  - 10) Be registered to the BRTA of Bangladesh; and
  - 11) Accompanied by an experienced livestock handler, if available and possible.
- l) Transport of animals should be done at the coldest time of the day to avoid heat stress.
- m) The transporter should be fully responsible for the care and welfare of the animal as well as ensure the cleanliness of the vehicle during the entire process of transporting, such as:
  - 1) Supply of feed and water;
  - 2) Care and nursing of animal;

- 3) Waste disposal- animal waste should be disposed with environment friendly way;
- 4) First aid to the injured animal and
- 5) Other required support to the animal to ensure welfare
- n) Animals should be segregated according to species, size, sex, age or customer desires.
- o) For long journey, the transporter should provide extra attention and needs to ensure animal welfare, like rest, and supply of feed and water.
- p) A transport/movement permit should be taken before shipping animals as required by the regulations and an animal health certificate signed by a Registered Veterinarian.
- q) When a second party involves to ship the live animals, the shipper should be properly informed of the recommendations stated in **a) to o)**.
- r) If the transporting animal become sick, veterinary support could be taken from the nearby veterinary hospital, if any, or from a Registered Veterinarian upon calling.
- s) Day old birds should be packed in packaging containers as required by the regulations.
- t) However, the day-old birds do not require feed and water as they are getting enough nutrition and metabolic water from the yolk sac.
- u) For transporting poultry, no feed and water is required for a short journey, but for a long journey, they should get rest, and supply of feed and water.

## **16.2. Responsibilities of Animal Enterprises**

### **16.2.1. Responsibilities of Owner to the Workers and Managers**

- a) The owner/manager should always promote a safe and healthy working condition in the farm/establishment.
- b) The owner should ensure that all farm managers and farm workers are in good health and undergo annual routine health check-up/medical examinations.
- c) The owner/manager should provide necessary accommodation for the residential staff.
- d) The owner should encourage the promotion of gender equality in the workplace.
- e) Accident and emergency management procedures should be available with clear instructions for all workers.
- f) First aid kits, fire extinguishing equipment and information on hotline numbers should be easily available at all times, and placed noticeably in strategic locations.
- g) The farm worker should be insured against accidents in conduct of his/her farm work.

- h) The farm owner should report to relevant authorities any occurrence of accidents in the farm which may result in serious physical injuries of workers.
- i) The farm manager/owner should provide farm workers with appropriate attire and footwear for protective measures.
- j) The farm workers should be equipped with suitable protective gears and tools while working in the farm.
- k) The respective farm workers should be equipped with standard and recommended personal protective equipment (PPE) while handling sick animals.
- l) Suitable working uniform and footwear should be provided to the farm manager, workers and visitors as prescribed by the management.
- m) Farm workers and manager should be vaccinated against the prevailing zoonotic diseases in that area and farm maintaining the rules of the respective vaccine.

#### **16.2.2. Legal Responsibilities of the Animal owner/farm manager**

- a) The farm owner should conform to existing animal farming and welfare legislation. This covers the management of environment issues, farm location, animal welfare requirements, disease control and reporting, dead animal disposal, animal and farm waste disposal, production of wholesome food and occupational hazards associated with animal farming.
- b) The animal owner/farm manager should conform to the existing labor legislation and observe the International Labor Organization (ILO) Conventions and Recommendations on Child Labor.

#### **16.2.3. Animal Welfare Responsibilities**

The animal owner/farm manager should be responsible for the welfare of the animals by giving adequate provisions so that they are able to perform at their optimum levels.

##### **16.2.3.1. The Farm Workers Should Not Cause Cruelty to Animals, in Accordance With 'The Animal Welfare Act, 2019' Of Bangladesh**

- a) Maltreatment of animals under his/her care and attention.
- b) Neglect of an animal, such that it experiences pain, suffering or distress.
- c) Failure to implement the proper feeding program to maintain the live weight of the animal within the normal physio-standard range for the species type, age and sex.

- d) Removal of any part of the anatomy, whenever necessary, without suitable anesthesia and under the direct care of a Registered Veterinarian.
- e) Putting to euthanasia, confine, handle or transport any animal in a manner causing deliberate pain, suffering or distress.
- f) Keeping an animal alive, especially that which is pronounced physically or physiologically incapacitated, unless it is under the direct care of a Registered Veterinarian.

#### **16.2.3.2. Farm Workers Should Not Neglect Animals as per the Criteria Mentioned**

- a) Freedom from hunger and thirst and malnutrition;
- b) Freedom from physical discomfort and pain;
- c) Freedom from injury and disease;
- d) With due consideration to the differences in the production system, animals should be given enough freedom to conform to essential behavior patterns; and
- e) Freedom from fear and distress.

#### **16.2.4. Documentation, Review and Evaluation Responsibilities**

A large scale and industrial production and even a smallholders' farms should have-

- a) vision and mission of the establishment;
- b) a policy statement that covers commitment and emergency procedures;
- c) documents of management system and that should be available for inspection;
- d) operational documents of food safety and public health;
- e) operational documents including biosecurity, sanitation and environment;
- f) operational documents of workers safety and welfare, animal welfare and
- g) an organizational chart and directory of the establishment.

#### **16.2.4.1. Record Keeping**

When a problem arises in the animal farm or facility, it may be a disease, a chemical hazard issue, a physical safety matter or be other issue, record keeping is vital to trace the source of the problem and to eliminate it.

#### **16.2.4.1.1. Criteria for Good Record Keeping**

If records are not to be more troublemakers than they are worth to the farmers, however, the records should satisfy the following criteria:

- a) Records must be useful- data that will not be usable in future to make decision by the management, it should not be recorded at all.
- b) Records must be kept in such a form that they can easily be converted into information- before keeping a record, the eventual end use must be ensured which will facilitate further analysis and interpretation.
- c) Record keeping systems should be precise, complete and easily understandable to all.
- d) Duplication must be avoided as much as possible- Some data may have to be recorded more than once in different forms, but this must be reduced to a minimum.
- e) Records must lead to actions being taken- Information must lead to quick actions. Unless a record is specifically intended to be used for some future action or in management planning.

#### **16.2.4.1.2. Types of Farm Recordings**

There are different types of farm recordings, however, the following list provides the most applicable types of farm recordings at smallholder farmer level:

- a) Animal Identification/history records– Animal identification/history records provide information about major events occurred on individual animals from birth up to the time it leaves the herd (death/sale) that includes-
  - 1) Animal name or identification number,
  - 2) Place of purchase,
  - 3) Name of farmer,
  - 4) Type of management system,
  - 5) Sex of animal,
  - 6) Date of birth,
  - 7) Age of animal,
  - 8) Body condition score,
  - 9) Date of purchase,
  - 10) Breed type,
  - 11) Gestation period,
  - 12) Calving interval,
  - 13) Lactation length,
  - 14) Milk yield (per day and total yield),
  - 15) Date of drying,
  - 16) Identification number of the offspring,
  - 17) Sex of the offspring,
  - 18) Age at culling, date of disposal (sales/death).

b) Breeding records- Breeding records are kept to measure the productive efficiency of the herd and to enable selection and culling, which includes-

1) Pedigree information- parents, grandparents, great grandparents etc.

2) Individual performance record-

- |  |                              |
|--|------------------------------|
| (a) parity of animal,                      | (h) age at first heat,       |
| (b) birth weight,                          | (i) weight at puberty,       |
| (c) 3-month interval body weight,          | (j) services per conception, |
| (d) date of weaning,                       | (k) age at first calving,    |
| (e) weaning age,                           | (l) post-partum heat period, |
| (f) weaning weight,                        | (m) calving interval,        |
| (g) date of puberty,                       | (n) gestation length,        |
| (o) generation interval,                   |                              |
| (p) age at puberty                         |                              |
| (q) semen volume/ejaculation,              |                              |
| (r) pH of semen,                           |                              |
| (s) sperm concentration,                   |                              |
| (t) motility of sperm (% of motile sperm), |                              |
| (u) abnormality of sperm etc.              |                              |

c) Milk Production records- Milk recording allows the farmer to track their best and worst producers and adds significant value for proper selection and culling on the basis of production capability any surplus breeding stock being sold off farm and increases the chances of a bull calf being selected to be a breeder. However, milk Production records may include-

- |                                 |                            |
|---------------------------------|----------------------------|
| 1) 24-hours milk yield          | 8) Lactose content in milk |
| 2) Yearly milk yield            | 9) Somatic cell count      |
| 3) Specific gravity of milk     | 10) Lactation length       |
| 4) Total solids in milk         | 11) Lactation yield        |
| 5) Fat content in milk          | 12) Number of lactations   |
| 6) Solids-not-fat (SNF) in milk | 13) Calving interval, etc. |
| 7) Protein content in milk      |                            |

- d) Feeding records- Feeding records can be used to plan a feeding plan to identify the required amount of feed per day per animal in various age like adults, infant, pregnant etc. Feed records may be kept on the basis of daily feed intake by a number of animals in a group based on age, pregnancy, milking and dry off, such as,
- 1) Post weaned calf group from weaning to 6 months of age,
    - (a) Young bull group from 6 to 12 months of age,
    - (b) Young heifer group 6 to 12 months of age,
    - (c) Non-pregnant heifer group after 12 months of age to pregnancy,
    - (d) Pregnant heifer group
    - (e) Lactating group and
    - (f) Dry off group, etc.
- e) Young stock records- Young stock records help the producer to decide which animal should be selected for the future of stock, Young stock records may include-
- 1) Animal identification number,
  - 2) Breed type,
  - 3) Date of birth/purchase,
  - 4) Sex of the animal
  - 5) Date of weaning,
  - 6) Age at weaning,
  - 7) Weekly health records
  - 8) Body weight at weaning,
  - 9) Weekly body weight and body weight gain,
  - 10) Age at weighing weekly,
  - 11) Body weight at 6 and 12 months of age,
  - 12) Selected/culled, etc.
- f) Health records- Health records help the producers to identify the health potentiality, longevity and ultimate fate of an animal, i.e., the animal will continue in the farm or be culled. Health records may include-
- 1) Vaccinations:
    - (a) Date of vaccination with the name of vaccine
    - (b) Vaccination schedule for the future
  - 2) Infectious disease history:
    - (a) Treatment given for the infectious disease,
    - (b) Result of the treatment given for the infectious disease,
    - (c) Complication after recovery from the infectious disease, if any,
  - 3) Metabolic disorder/disease history,
    - (a) Treatment given for the metabolic disorder/disease
    - (b) Result of the treatment given for the metabolic disorder/disease
    - (c) Complication after recovery from the metabolic disorder/disease, if any,

- 4) Periparturient disease
  - (a) Calving difficulty
  - (b) Retained placenta
  - (c) Uterine infections- Metritis, endometritis etc.
  - (d) Pseudopregnancy- Hydrometra, mucometra etc.
- 5) Lactation disorders:
  - (a) Mastitis
  - (b) Agalactia, dysgalactia etc.
- 6) Disease/disorders during dry off
- 7) Measures taken for prevention and control of disease
- g) Procurement records
- h) Laboratory activities records
- i) Sanitation, Hygiene and Pest control records
- j) Waste management records
- k) Storage records
- l) Visitor records
- m) Transportation records
- n) Social welfare including farm Personnel/workers- measures taken with date and result, especially regarding personnel health and training
- o) Financial records- Financial records tell the producer about their profit-loss accounts.

The components of financial records may as follow-

- 1) Expenditure: per year
  - (a) Feed and management costs for animals
    - (1) Dairy animal management costs
    - (2) Post weaning management costs
    - (3) Young stock management costs
  - (b) Health management costs
  - (c) Breeding costs
  - (d) Animal procurement costs including transportation costs
  - (e) Other procurement costs- e.g., laboratory consumables and appliances costs, equipment and appliances for farm management costs etc.
  - (f) Personnel cost- Salary and bonus

- (g) Sanitation, Hygiene and Pest control cost
  - (h) Waste management cost
  - (i) Visitors and Transportation cost
  - (j) Miscellaneous costs
- 2) Income: per year
- (a) Milk sale
  - (b) Milk byproduct sale
  - (c) Young bull sale
  - (d) Young heifer sale
  - (e) Replacement heifer sale
  - (f) Culled animal sale
  - (g) Fodder sale, if possible
  - (h) Feed sale, if possible
  - (i) Manure sale
  - (j) Others income

Therefore, profit from farm management per year = b – a

$$= \text{Income per month} - \text{Expenditure per month} = c$$

Therefore, profit from farm management per month =  $c \div 12 = d$ .

Although, according to the 'WOAH Guide to Good Farming Practices for Animal Production Food Safety', as far as is practicable, farmers should keep records of:

- 1. Animal identification;
  - 2. Animal source, especially import animals;
  - 3. Feed;
  - 4. Animal Health (Treatment and Vaccination);
  - 5. Animal movement;
  - 6. Laboratory;
  - 7. Sanitation and Hygiene;
  - 8. Pest control;
  - 9. Personnel Health and Training;
  - 10. Waste management;
  - 11. Production;
  - 12. Procurement;
  - 13. Storage;
  - 14. Visitor;
  - 15. Transportation;
  - 16. Traceability
- e.g. animal/lot/batch ID, customer record, etc.

**Note:**

The records should be kept for a minimum of 3 years or as specified by the authority.

**16.2.4.2. Review and Evaluation of the Practices**

- a) Review is a formal assessment of something with the intention of starting change, if necessary and evaluation is a process that critically examines a program, and is done to generate a robust understanding of the strengths, weaknesses and appropriateness.
- b) The 'Good Livestock Husbandry Practices' should be reviewed/checked for compliance and evaluated for appropriateness and effectiveness, and doability on a regular basis.
- c) In cases where provisions are no longer applicable or effective, they shall be amended.
- d) The amended provisions should be adopted immediately.
- e) Review, evaluation and adjustment of the practices shall be done with a regular interval.

**Notes:**

1. Recommendations for validation, approval, dissemination and implementation process of the NG-GLPP have been mentioned in the Appendix 46.

## REFERENCES

- Akinbobola, A. 2022. The Nutritional Requirements of Chick, Pullet & Layer. Published in: Livestocking as blog. Available at: <https://www.livestocking.net/nutritional-requirements-chicks-pullets-layers>
- Arora A, Bhatia S, Sodhi M, Sahana G, Mukesh M and Ahlawat S. P. S. 2005. Sheep genetic resources of India-Garole, the profiling microsheap of India. National Bureau of Animal Genetic Resources (India Council of Agricultural Research-ICAR), A Monograph. pp. 6.
- ASEAN (Association of Southeast Asian Nations). 2015. ASEAN Good Animal Husbandry Practices- For Layers and Broilers and Food Safety. Eds. by Robert Premier. Available at: <https://asean.org/wp-content/uploads/2021/09/ASEAN-Food-Safety-Module-GAHP-For-Layers-and-Broilers.pdf>
- Banerjee, R. 2008. Conservation and in situ development of a prolific indigenous sheep in the Sundarban and Sagar Island. Ph.D. Thesis, University of Calcutta, Kolkata, West Bengal, India.
- BBS (Bangladesh Bureau of Statistics). 2019. Agriculture Census (6th), Statistics and Informatics Division, Ministry of Planning, Government of the People's Republic of Bangladesh.
- Beneventi, A. 2021. How to optimise layer breeder flock performance. Published in: Web site of Poultry World. Available at: <https://www.poultryworld.net/health-nutrition/how-to-optimise-layer-breeder-flock-performance/>
- Bhuiyan AKFH. 2014. Farm Animal Genetic Resources in Bangladesh: Diversity, Conservation and Management. In: Farm Animal Genetic Resources in SAARC Countries: Diversity, Conservation and Management. 2014. SAARC Agriculture Centre (SAC), Dhaka 1215, Bangladesh. Available at: [https://www.researchgate.net/publication/327662285\\_Farm\\_Animal\\_Genetic\\_Resources\\_in\\_Bangladesh\\_Diversity\\_Conservation\\_and\\_Management\\_In\\_Farm\\_Animal\\_Genetic\\_Resources\\_in\\_SAARC\\_Countries\\_Diversity\\_Conservation\\_and\\_Management\\_2014\\_SAARC\\_Agriculture\\_Centr](https://www.researchgate.net/publication/327662285_Farm_Animal_Genetic_Resources_in_Bangladesh_Diversity_Conservation_and_Management_In_Farm_Animal_Genetic_Resources_in_SAARC_Countries_Diversity_Conservation_and_Management_2014_SAARC_Agriculture_Centr)
- Boring, EG. 1957. When Is Human Behavior Predetermined? *The Scientific Monthly*, 84(4), 189–196. Available at: <http://www.jstor.org/stable/22104>
- Cooper T. 2021. Breed Profile: Beetal Goats, Versatile Indian and Pakistani Goat of the Punjab. Available at: <https://backyardgoats.iamcountryside.com/goat-breeds/beetal-goats-breed-profile/>
- CRS (Congressional Research Service). 2010. Animal Identification and Traceability: Overview and Issues. CRS Report for Congress (R40832) USA, [www.crs.gov](http://www.crs.gov). Available at: <https://crsreports.congress.gov/product/pdf/R/R40832>
- Daniel Jr. DL and Kriese-Anderson LA. 2017. Beef Conformation Basics. In: LIVESTOCK & POULTRY. The Alabama Cooperative Extension System, Alabama A&M University and Auburn University. Available at: [https://www.aces.edu/wp-content/uploads/2018/09/ANR-1452.REV\\_.3.pdf](https://www.aces.edu/wp-content/uploads/2018/09/ANR-1452.REV_.3.pdf)

- DAP (Department of Agriculture, Philippines). 2019. Good Animal Husbandry Practices (Illustrative Guide). Available at:  
[http://www.bafs.da.gov.ph/bafs\\_admin/admin\\_page/publications\\_pdf/GAHP\\_Illustrative%20Guide\\_revise12.10.2020.pdf](http://www.bafs.da.gov.ph/bafs_admin/admin_page/publications_pdf/GAHP_Illustrative%20Guide_revise12.10.2020.pdf)
- DAS (Department of Animal Science). 2022. Feeding the Dairy Cow During Lactation (Dairy Cattle Production 342-450A). Faculty of Agricultural and Environmental Sciences, MacDonald Campus of McGill University, Montreal, Quebec, Canada. Site visited on 8 August 2022. Available at:  
[https://smallfarms.oregonstate.edu/sites/agscid7/files/feedingmilkingcow\\_1.pdf](https://smallfarms.oregonstate.edu/sites/agscid7/files/feedingmilkingcow_1.pdf)
- Das SC, M Yahya, Hasan MS, Hossain MA, Akter T and Sultana M. 2018. Growth performance of white, black and bronze color heritage turkeys under semi-intensive system. *Journal of Bangladesh Agricultural University*, 16(3): 471–477.
- Dhanda OP, 2013. Changing Dynamics in Buffalo Production Systems in South Asian Region. *Buffalo Bull.*, 32: 311-317.
- Dhara KC, Ray N., Taraphder S. and Guha S. 2012. Milk production performance of Black Bengal goats in West Bengal. *International Journal of Livestock Production*, February 2012, 3(2): 17-20.
- DLS (Department of Livestock Services). 2016. Livestock Economy at a glance, 2015-2016. Available at:  
[http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621\\_fa3a\\_40ac\\_8bd9\\_898fb8ee4700/Updated%20Livestock%20Economy%20%282015-2016%29.pdf](http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/Updated%20Livestock%20Economy%20%282015-2016%29.pdf)
- DLS (Department of Livestock Services). 2022. Livestock Economy at a glance, 2021-2022. Available at:  
[http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621\\_fa3a\\_40ac\\_8bd9\\_898fb8ee4700/2022-07-18-03-43-37d18965a6458cda3c542ab146480962.pdf](http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/2022-07-18-03-43-37d18965a6458cda3c542ab146480962.pdf)
- Enos HL. 2018. Brooding and Space Requirements for Poultry. Colorado State University Extension, Fort Collins, Colorado 80523, USA. Available at:  
<https://extension.colostate.edu/topic-areas/agriculture/brooding-and-space-requirements-for-poultry-2-502/>
- FAO (Food and Agriculture Organization of the United Nations). 2021. Climate-smart livestock production. *A practical guide for Asia and the Pacific region*. Bangkok, Thailand. Available at: <https://www.fao.org/3/cb3170en/cb3170en.pdf>
- Faruque, MO, Hasnath MA and Siddique NU. 1990. Present status of buffaloes and their productivity. *Asia-Australian Journal Animal Science*, 3: 287-292.
- GED-BPC (General Economics Division-Bangladesh Planning Commission). 2020. Making Vision 2041 a Reality: PERSPECTIVE PLAN OF BANGLADESH 2021-2041. Bangladesh Planning Commission, Ministry of Planning, Government of the People's Republic of Bangladesh, March 2020. Available at:  
[http://www.plancomm.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/10509d1f\\_aa05\\_4f93\\_9215\\_f81fcd233167/2020-08-31-16-08-8f1650eb12f9c273466583c165a315a4.pdf](http://www.plancomm.gov.bd/sites/default/files/files/plancomm.portal.gov.bd/files/10509d1f_aa05_4f93_9215_f81fcd233167/2020-08-31-16-08-8f1650eb12f9c273466583c165a315a4.pdf)

- Hassan MM, Niaz Mahmud SM, Azizul Islam SKM, Miazi OF. 2007. A comparative study on reproductive performance and productivity of the Black Bengal and crossbred goat at Atrai, Bangladesh. *Univ. J. Zool.*, 26: 55-57.
- Hassan, MR and Talukder, MAI. 2011. Comparative performance of different regional native sheep in Bangladesh. *The Bangladesh Veterinarian*. 28 (2):85-94.  
<https://doi.org/10.3329/bvet.v28i2.10692>
- Hossain MS, Akhtar A, Hossain MH, Choudhury MP and Islam, F. 2015. Goat husbandry practices in Southern region of Bangladesh. *Journal of Bioscience and Agriculture Research*, 05 (02), 59-64.
- Islam S, Bhuiyan AKFH, Ersaduzzaman, Hossain M, Lee SH and Bhuiyan MSA. 2018. Morphometric Features, Production and Reproduction Potentials of Indigenous Sheep Genetic Resources of Bangladesh. *Journal of Animal Breeding and Genomics*, 2(2): 001-008.
- Kriseldi R, Walk CL, Bedford MR and Dozier III WA 2021. Inositol and gradient phytase supplementation in broiler diets during a 6-week production period: 1. effects on growth performance and meat yield. *Poultry Science*, 100:964–972.
- KVK (Krishi Vigyan Kendra). 2022. Package of Practices for cattle and Buffalo. Krishi Vigyan Kendra Knowledge Network, Indian Council of Agricultural Research (ICAR), India. Visited on 10 December 2022. Available at:  
[https://kvk.icar.gov.in/API/Content/PPupload/k0347\\_10.pdf](https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf)
- Linden J. 2014. Management Programme for Raising Breeder Duck Flocks. Published in The Poultry Site. Available at: <https://www.thepoultrysite.com/articles/management-programme-for-raising-breeder-duck-flocks>
- Magazines C. 2017. Beef cattle conformation basics. Available at:  
<https://www.farmersweekly.co.za/farming-basics/how-to-livestock/beef-cattle-conformation-basics/>
- Manoj S, Gurdeep S and Baljit S. 2008. Know about Important Breeds of Dairy Cattle and Buffaloes in India. 27 p.
- Melville A and Rakotomalala S. 2008. After the guidelines; The challenge of implementation. *Intervention*, 6(3/4): 338 – 347.
- Miah G, Das A, Bilkis T, Momin MM, Uddin MA, Alim MA, Mahmud MS and Miazi OF. 2016. Comparative Study on Productive and Reproductive Traits of Black Bengal and Jamnapari Goats under Semi-Intensive Condition. *Scientific Research Journal*, 4(2):1-7.
- Murshed, HM. 2014. Study on Handling, Processing and Microbial Quality of Meat at Dhaka, Chittagong And Sylhet Division in Bangladesh. An MS Thesis, Submitted to the Department of Animal Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.
- MWI-AH (MWI Animal Health). 2016. Dewormers for Beef and Dairy Cattle. AmerisourceBergen Corporation. Available at: [https://www.mwiah.com/our-insights/-/media/assets/mwianimalhealth/insights-articles/doc\\_dewormersforbeefanddairycattle.pdf](https://www.mwiah.com/our-insights/-/media/assets/mwianimalhealth/insights-articles/doc_dewormersforbeefanddairycattle.pdf)

- NDDDBI (The National Dairy Development Board, India). 2022. Vaccination Schedules for Cattle and Buffalo. Vaccination, farmer's Corner. In the website of the National Dairy Development Board, India. Visited on 8 December 2022. Available at: <https://www.nddb.coop/farmer/animal-health/vaccination/schedules>
- NRC (National Research Council). 2001. Nutrient requirements of dairy cattle. Seventh revised edition. Washington, DC: National Academy Press. Available at: [https://www.academia.edu/26451345/Nutrient\\_Requirements\\_of\\_Dairy\\_Cattle\\_Seventh\\_Revised\\_Edition\\_2001](https://www.academia.edu/26451345/Nutrient_Requirements_of_Dairy_Cattle_Seventh_Revised_Edition_2001)
- Pan S and Sahoo AK. 2003. Garole Sheep, Report of Ad-Hoc Research Scheme on Survey Evaluation of Garole Sheep in Sundarban Area of West Bengal. WBUAFS, Mohanpur, West Bengal.
- Pan, S, Sahoo AK, Tantia MS and Ahlawat SPS, 2004. Garole Sheep, NATP (MM) on Animal Genetic Resource Bio-Diversity. WBUAFS, Mohanpur and Kolkata, West Bengal and NBAGR, Karnal, Haryana, India.
- Rahman MM, Hoque MA, Saha NG, Faruque MO. 2013. Studies on management system and identification of the causes of genetic erosion of indigenous cattle in Mymensingh district. *Bang. J. Anim. Sci.* 42: 23-28.
- Reichenbach HB and Amaral-Phillips DM. 2022. Hoof Trimming of Dairy Cows, Department of Animal & Food Sciences, College of Agriculture, Food and Environment, University of Kentucky, Lexington, USA. Visited website on 27 November 2022. Available at: <https://afs.ca.uky.edu/content/dairy-hoof-trimming-dairy-cows#:~:text=The%20bovine%20hoof%20grows%20at,approximately%202%20inches%20per%20year.>
- Roess AA, Winch PJ, Ali NA, Akhter A, Afroz D, Arifeen SE, Darmstadt GL and Baqui AH. 2013. Animal Husbandry Practices in Rural Bangladesh: Potential Risk Factors for Antimicrobial Drug Resistance and Emerging Diseases. *Am. J. Trop. Med. Hyg.*, 89(5): 965–970.
- Sharma B, Nimje P, Tomar SK, Dey D, Mondal S and Kundu SS. 2020. Effect of different fat and protein levels in calf ration on performance of Sahiwal calves. *Asian-Australas J Anim Sci.*, 33(1): 53–60.
- Singh SK. 2011. Vaccination Schedule for Farm and Companion Animals. In book: Chapter-03, FAQs on Vaccines and Immunization Practice. Eds by: Aggarwal A. Available at: [https://www.researchgate.net/publication/278731118\\_Vaccination\\_Schedule\\_for\\_Farm\\_and\\_Companion\\_Animals](https://www.researchgate.net/publication/278731118_Vaccination_Schedule_for_Farm_and_Companion_Animals)
- Sohel MMH and Amin MR, 2015. Identification of types of buffaloes available in Kanihari buffalo pocket of Mymensingh. *Res. Agri. Livest. Fish.*, 2: 109-115.
- Stamschror J, Seykora DT and Hansen L. 2000. Judging Dairy Cattle. University of Minnesota, USA. Available at: [https://www.aphis.usda.gov/animal\\_health/emergingissues/compensation/downloads/judgingdairycattle.pdf](https://www.aphis.usda.gov/animal_health/emergingissues/compensation/downloads/judgingdairycattle.pdf)
- TNAU (Tamil Nadu Agricultural University). 2022d. Vaccination Schedule for Poultry Birds, Animal Husbandry, TNAU Agritech Portal, Tamil Nadu Agricultural University

- (TNAU), Coimbatore - 641 003. Tamil Nadu, India. Website visited on 8 December 2022. Available at:  
[https://agritech.tnau.ac.in/animal\\_husbandry/ani\\_poultry\\_vaccination%20schd.html](https://agritech.tnau.ac.in/animal_husbandry/ani_poultry_vaccination%20schd.html)
- TNAU (Tamil Nadu Agricultural University, Tamil Nadu, India). 2022a. Breeding management of cattle and buffaloes. Visited the site on 22 August 2022. Available at:  
[http://www.agritech.tnau.ac.in/expert\\_system/cattlebuffalo/Breeding%20management%20of%20cattle%20and%20buffaloes-2.html](http://www.agritech.tnau.ac.in/expert_system/cattlebuffalo/Breeding%20management%20of%20cattle%20and%20buffaloes-2.html)
- TNAU (Tamil Nadu Agricultural University, Tamil Nadu, India). 2022b. Breeder management. Visited the site on 10 August 2022. Available at:  
[http://www.agritech.tnau.ac.in/expert\\_system/poultry/Breeder%20Management.html](http://www.agritech.tnau.ac.in/expert_system/poultry/Breeder%20Management.html)
- TNAU (Tamil Nadu Agricultural University, Tamil Nadu, India). 2022c. Feeding Management and Methods. Expert System for Sheep and Goat. Visited the site on 22 November 2022. Available at:  
[http://www.agritech.tnau.ac.in/expert\\_system/sheepgoat/Feeding%20Management%20of%20Sheep%20and%20Goats.html](http://www.agritech.tnau.ac.in/expert_system/sheepgoat/Feeding%20Management%20of%20Sheep%20and%20Goats.html)
- UK (University of Kentucky). 2022. Water Quality. In: Poultry Production Manual, Chapter 12, by UK Ag Extension and Kentucky Poultry Federation. Visited on 21 November 2022. Available at: <https://afs.ca.uky.edu/files/chapter12.pdf>
- Verma, D., Singh, S., Shukla, A., Pandey, R., Pankaj, N., Singh, K., et al. 2017. "Effect of Grooming and Bathing on Milk Yield and Milk Composition in Crossbred Cows during Summer Season." *Journal of Pharmacognosy and Phytochemistry* 6 (1): 987-9.
- Waterman DF and Mills J. 2007. Evaluating Milk Replacer Quality. Professional Dairy Heifer Growers Association, Pre-Conference Calf Seminar Robert E. James, Virginia Cooperative Extension, 2005, There are no free rides.
- WOAH (World Organization for Animal Health). 2008. Animal identification and product traceability from the farm to the fork must be progressively implemented worldwide. Available at: <https://www.woah.org/en/animal-identification-and-product-traceability-from-the-farm-to-the-fork-must-be-progressively-implemented-worldwide/#:~:text=The%20pillars%20of%20a%20traceability,this%20information%20in%20appropriate%20registers.>
- WOAH (World Organization for Animal Health). 2022. General Principles on Identification and Traceability of Live Animals. In: Terrestrial Animal Health Code, article 4.2.1, Chapter 4.2., Published on 10/08/2022. Available at:  
[https://www.woah.org/fileadmin/Home/eng/Health\\_standards/tahc/current/chapitre\\_ident\\_traceability.pdf](https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_ident_traceability.pdf)
- Zailan MZ and Yaakub H. 2018. Milk composition and fatty acids profile at different stages of lactation in Jamnapari crossbred goats. *Mal. J. Anim. Sci.*, 21(2): 109-122.
- Zeshmarani S, Dhara KC, Samanta AK, Samanta R, Majumder SC. 2007. Reproductive performance of goats in Eastern and Northeastern India. *Livest. Res. Rural Dev.*, 19: 8.

## APPENDICES

### Appendix 1:

তফসিল ৭(গ)

গ্রান্ড গ্র্যান্ড/গ্রান্ড প্যারেন্ট (জিজিপি/জিপি) স্টক খামার স্থাপন এর শর্তাবলী :  
[বিধি-১৮ দ্রষ্টব্য]

- ১। লোকালয়ের বাহিরে গ্রান্ড গ্র্যান্ড/গ্রান্ড প্যারেন্ট স্টক খামার স্থাপন করিতে হইবে।
- ২। খামারের চতুর্দিকের কমপক্ষে ৫ কিঃমিঃ এর মধ্যে গবাদি পশু, পাখির খামার, মিট প্রসেসিং কারখানা এবং অন্য কোন ভারী শিল্প কারখানা থাকিতে পারিবে না।
- ৩। অবশ্যই এনভাইরনমেন্টাল কন্ট্রোল হাউজ হইতে হইবে।
- ৪। উন্নত বায়ো-সিকিউরিটি অনুসরণ করিতে হইবে।
- ৫। সরকার কর্তৃক অনুমোদিত নিজস্ব রোগ নির্ণয়ের ল্যাবরেটরী থাকিতে হইবে।
- ৬। হ্যাচারী ওয়েস্ট (উঘএ) অসুস্থ/মৃত বার্ড অপসারণের জন্য ইনসিনারেটর থাকিতে হইবে।
- ৭। হ্যাচারী সর্বদা সিঙ্গেল স্টেজ হইতে হইবে।
- ৮। নিজস্ব ফিড মিল থাকিতে হইবে।
- ৯। লোকালয়ে কোন দুর্গন্ধ/অসুবিধা সৃষ্টি করিতে পারিবে না।
- ১০। অসুস্থ মুরগী পরিচর্যার জন্য পৃথক সেডের ব্যবস্থা থাকিতে হইবে।
- ১১। খামারের পরিচর্যায় কর্মরত সকলের খামারের মধ্যে আবাসনের ব্যবস্থা থাকিতে হইবে।
- ১২। পাখির ইতিহাস, রোগাক্রান্তের হার, রোগের লক্ষণ, প্রদত্ত চিকিৎসা, মৃত্যুহার, পোস্টমর্টেম রিপোর্ট, ল্যাবরেটরী পরীক্ষার রিপোর্ট, রোগের স্ক্রিনিং পদ্ধতি, স্ক্রিনিং এর ফলাফলসহ রোগ সংক্রান্ত রেকর্ড সংগ্রহ ও সংরক্ষণ করিবেন এবং পশুসম্পদ অধিদপ্তরকে নিয়মিত সরবরাহ করিতে হইবে।
- ১৩। অভিজ্ঞ ভেটেরিনারীয়াানের সার্বিক তত্ত্বাবধানে খামার পরিচালিত হইতে হইবে।
- ১৪। গ্রান্ড প্যারেন্ট স্টক ভার্টিক্যাল ডিজিজ মুক্ত হইতে হইবে।
- ১৫। গ্রান্ড প্যারেন্ট স্টক/প্যারেন্ট স্টক বাচ্চা সরবরাহের সাথে অবশ্যই ভেটেরিনারী কর্মকর্তা প্রদত্ত হেল্থ সার্টিফিকেট থাকিতে হইবে।
- ১৬। বিক্রিত প্যারেন্ট বাচ্চা কোন হ্যাচারীতে পাঠান হইয়াছে তার রেকর্ড সংরক্ষণ করণ।
- ১৭। খামারে বর্জ্য (ব্যবহৃত লিটারসহ) অপসারণের আধুনিক ব্যবস্থাপনা থাকিতে হইবে।
- ১৮। খামার নিবন্ধনকৃত হইতে হইবে।

Appendix 2:

তফসিল ৭(ঘ)

প্যারেন্ট খামার স্থাপন এর শর্তাবলী :  
[বিধি-১৮ দ্রষ্টব্য]

- ১। লোকালয়ের বাহিরে খামার স্থাপন করিতে হইবে।
- ২। খামারের চতুর্দিকে ২ কিঃমিঃ মধ্যে কোন কমাশিয়াল/প্যারেন্ট স্টক ফার্ম থাকিতে পারিবে না।
- ৩। উন্নত বায়ো-সিকিউরিটি অনুসরণ করিতে হইবে।
- ৪। ওপেন সেডের ে ত্রে এক সেড থেকে অন্য সেডের দূরত্ব কমপে ৬০ ফিট হইতে হইবে এবং সেডের উচ্চতা হইবে মেঝে থেকে ১২ ফিট।
- ৫। মৃত পাখি ডিসপোসালের জন্য ইনসিনারেটর থাকিতে হইবে।
- ৬। খামারের স্থান জলাবদ্ধতা মুক্ত উচ্চ ও শুষ্ক জমি হইতে হইবে।
- ৭। লোকালয়ে কোন দুর্গন্ধ/অসুবিধা সৃষ্টি করিতে পারিবে না।
- ৮। দূষণমুক্ত পরিবেশ থাকিতে হইবে।
- ৯। অসুস্থ মুরগী পরিচর্যার জন্য পৃথক সেডের ব্যবস্থা করিতে হইবে।
- ১০। খামারে লোকজন/যানবাহন প্রবেশ নিয়ন্ত্রণের ে ত্রে স্বাস্থ্য সম্মত ফুটপাত/পোষাক ও বুটের ব্যবস্থা থাকিতে হইবে।
- ১১। চিকিৎসা ও ঔষধপত্রের ব্যবস্থা থাকিতে হইবে।
- ১২। খামারে টিকা প্রদান সংক্রান্ত সকল তথ্য সংর ণ করিতে হইবে।
- ১৩। মুরগী ভার্টিক্যাল ডিজিজ মুক্ত হইতে হইবে।
- ১৪। বাচ্চা সরবরাহের ে ত্রে ভেটেরিনারি কর্মকর্তার হেল্থ সার্টিফিকেট থাকিতে হইবে।
- ১৫। অধিদপ্তরের চাহিদা মোতাবেক যে কোন তথ্য সরবরাহ করিতে বাধ্য থাকিবে।
- ১৬। খামারে বর্জ্য (ব্যবহৃত লিটারসহ) অপসারণের আধুনিক ব্যবস্থাপনা থাকিতে হইবে।
- ১৭। খামার নিবন্ধনকৃত হইতে হইবে।

Appendix 3:

তফসিল ৭(ঙ)

বাণিজ্যিক খামার (জিপি ও পি এস বাদে) স্থাপন এর শর্তাবলী :  
[ বিধি-১৮ দ্রষ্টব্য ]

- ১। একটি বাণিজ্যিক খামার থেকে আর একটি বাণিজ্যিক খামারের দূরত্ব কমপক্ষে ২০০ মিটার হইতে হইবে।
- ২। কন্ট্রোল বা ওপেন সিস্টেম হাউজ হইতে হইবে।
- ৩। ওপেন হাউজের ক্ষেত্রে সেড থেকে সেডের দূরত্ব ৪৫ ফিট হইতে হইবে।
- ৪। বাজারজাত করার সময় ভেটেরিনারি কর্মকর্তার নিকট হইতে জনস্বাস্থ্যের ক্ষতি হইবে না অর্থাৎ স্বাস্থ্যগত উপযুক্ততার সনদপত্র নিতে হইবে।
- ৫। খামারের স্থান জলাবদ্ধতা মুক্ত উচ্চ ও শুষ্ক জমি হইতে হইবে।
- ৬। লোকালয়ে কোন দুর্গন্ধ/অসুবিধা সৃষ্টি করিতে পারিবে না।
- ৭। খামারে দূষণমুক্ত পরিবেশ থাকিতে হইবে।
- ৮। অসুস্থ মুরগী পরিচর্যার জন্য পৃথক সেডের ব্যবস্থা থাকিতে হইবে।
- ৯। খামারে লোকজন/যানবাহন প্রবেশ নিয়ন্ত্রণের ক্ষেত্রে স্বাস্থ্যসম্মত ফুটপাথ/পোষাক ও বুটের ব্যবস্থা থাকিতে হইবে।
- ১০। চিকিৎসা ও ঔষধপত্রের ব্যবস্থা থাকিতে হইবে।
- ১১। খামারে রোগাক্রান্তের হার, লক্ষণ, প্রাদুর্ভাবের সময় চিকিৎসা, পোস্টমর্টেম পরীক্ষার রিপোর্ট ও অন্যান্য পরীক্ষার ফলাফলসহ রোগ সংক্রান্ত রেকর্ড সংরক্ষণের ব্যবস্থা থাকিতে হইবে এবং কোন প্যারেন্ট স্টক বা খামার থেকে বাচ্চা সংগৃহীত তাহার রেকর্ড সংরক্ষণ করিতে হইবে।
- ১২। মৃত বার্ড ডিসপোজালের জন্য কমপক্ষে পিট থাকিতে হইবে। লিটার ম্যানেজমেন্টের জন্য কমপোস্ট সিস্টেম থাকিতে হইবে। মৃত মুরগী পিটে ফেলিতে হইবে।
- ১৩। খামারে উন্নত বায়ো-সিকিউরিটি অনুসরণ করিতে হইবে।
- ১৪। বিক্রয়ের সময় চালান/রশিদ দিতে হইবে।
- ১৫। আবাসিক বাড়ীর ভিতরে কোন বাণিজ্যিক খামার স্থাপন করা যাইবে না।
- ১৬। খামার নিবন্ধনকৃত হইতে হইবে।

Appendix 4:

গ্ৰাভ গ্ৰাভ প্যারেন্ট স্টক/গ্ৰাভ প্যারেন্ট স্টক স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র [বিধি-১৮ দ্রষ্টব্য]		ফরম ৮(গ)
<p>বরাবর, মহাপরিচালক, প্রাণিসম্পদ অধিদপ্তর, কৃষি খামার সড়ক, ফার্মগেট, ঢাকা।</p> <p>জনাব, আমি/আমরা নিম্নস্বা রকারী ব্যক্তি/ব্যক্তিবর্গ/কোম্পানী হাঁস-মুরগির গ্যারেন্ট প্যারেন্ট স্টক/প্যারেন্ট স্টক, খামার স্থাপন পরিচালনা করতে আগ্রহী। সংশ্লিষ্ট বিষয়ে প্রচলিত সরকারি নীতিমালা ও শর্তাবলী পালনে অঙ্গীকারাবদ্ধ।</p>		
ক.	আবেদনকারীর তথ্য	:
১।	আবেদনকারী ব্যক্তি/প্রতিষ্ঠানের নাম	:
২।	ঠিকানা	:
	(ক) স্থায়ী	:
	(খ) বর্তমান	:
৩।	খামারের তথ্য-চলমান হইলে বিদ্যমান স্থাপনে ইচ্ছুক হইলে পরিকল্পনা মাফিক তথ্য প্রদান করিতে হইবে।	:
৪।	মুরগির সংখ্যা	:
৫।	স্থাপনকাল (স্থাপনা চলমান হলে) বা সম্ভাব্য স্থাপনকাল (প্রতিষ্ঠানটি চলমান না হলে):	:
৬।	অবস্থান ও ঠিকানা	:
৭।	বর্তমানে কার্যক্রম চলমান কি না, হইলে চালুর তারিখ	:
৮।	চলমান না হইলে সম্ভাব্য চালুর তারিখ	:
৯।	লে-আউট প্লান (সংযুক্ত)	:
	(যে ে ত্রে সংগ্রহ করা হয় নাই সে ে ত্রে সংগৃহীতব্য প্লানের বিবরণ)	:
১০।	হাঁস-মুরগির জাত	:
১১।	ইনকিউবেটরের সংখ্যা	:
	(ক) সেটার	:
	(খ) হ্যাচার	:
১২।	পরিকল্পিত জনবল কাঠামো	:
১৩।	পরিকল্পিত নির্মাণের বর্ণনা	:
১৪।	বাচ্চা উৎপাদনের পরিমাণ	:
১৫।	বিদ্যুতের উৎস ও পরিমাণ	:
১৬।	সার্ব ণিক বৈদ্যুতিক ব্যবস্থার অবস্থা	:
১৭।	বায়োসিকিউরিটির শর্তাবলী অনুসরণ করা হয়েছে কি না	:
১৮।	রোগের তথ্যের সংর ণ পদ্ধতি	:
		হ্যা/না
		আবেদনকারীর স্বা র তারিখ (স্বত্বাধিকারীর নামসহ
		মতাপ্রাপ্ত ভেটেরিনারি কর্মকর্তার প্রত্যয়ন

Appendix 5:

ফরম ৮(ঘ)

হাঁস-মুরগীর প্যারেন্ট স্টক/বাণিজ্যিক খামার স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র  
[বিধি-১৮ দ্রষ্টব্য]

বরাবর,  
জেলা প্রাণিসম্পদ কর্মকর্তা,  
.....  
.....

জনাব,  
আমি/আমরা নিম্নস্বাক্ষরকারী ব্যক্তি/ব্যক্তিবর্গ/কোম্পানী হাঁস-মুরগির প্যারেন্ট স্টক/বাণিজ্যিক খামার স্থাপন ও পরিচালনা করতে আগ্রহী। সংশ্লিষ্ট বিষয়ে প্রচলিত সরকারি নীতিমালা ও শর্তাবলী পালনে অঙ্গীকারাবদ্ধ।

- |     |  |            |
|-----|--|------------|
| ১।  | আবেদনকারী ব্যক্তি/প্রতিষ্ঠানের নাম   | :          |
| ২।  | ঠিকানা   | :          |
|     | (ক) স্থায়ী  | :          |
|     | (খ) বর্তমান  | :          |
| ৩।  | হাঁস-মুরগির সংখ্যা   | :          |
| ৪।  | স্থাপনকাল (স্থাপনা চলমান হলে) বা সম্ভাব্য<br>স্থাপনকাল (প্রতিষ্ঠানটি চলমান না হলে)             | :          |
| ৫।  | খামারের অবস্থান ও ঠিকানা   | :          |
| ৬।  | বর্তমানে কার্যক্রম চলমান কি না, হইলে চালুর তারিখ   | :          |
| ৭।  | চলমান না হইলে সম্ভাব্য চালুর তারিখ   | :          |
| ৮।  | লে-আউট প্লান   | :          |
| ৯।  | খামারের ধরন  | :          |
|     | (ক) হাঁসের খামার (খ) প্যারেন্ট স্টক (গ) ব্রয়লার (ঘ) লেয়ার<br>(ঙ) অন্যান্য (উল্লেখ করতে হবে)। | :          |
| ১০। | জনবল কাঠামো  | :          |
| ১১। | পরিকল্পিত নির্মাণের বর্ণনা   | :          |
| ১২। | বায়োসিকিউরিটির শর্তাবলী অনুসরণ করা হয়েছে কিনা  | : হ্যাঁ/না |
| ১৩। | রোগের রেকর্ড সংরক্ষণের পদ্ধতি  | :          |
| ১৪। | বর্জ্য অপসারণের ব্যবস্থাপনার ধরন   | :          |

আবেদনকারীর স্বাক্ষর  
তারিখ  
(স্বত্বাধিকারীর নামসহ)

প্রয়োজনে অতিরিক্ত পৃষ্ঠা ব্যবহার করা যাইবে।

এলাকাধীন ভেটেরিনারি কর্মকর্তার প্রত্যয়ন আবেদনপত্র নিরীক্ষণের পূর্বক আমি আবেদনপত্রটি অনুমোদন/বাতিলের সুপারিশ করছি।

স্বা র  
উপজেলা/মেট্রোথানার মাতাপ্রাপ্ত-প্রাপ্ত ভেটেরিনারি  
কর্মকর্তা।

Appendix 6:

ফরম ৮ (ছ)

গরু/মহিষ/ছাগল/ভেড়া সহ বিভিন্ন রোমহুক পশুর বাণিজ্যিক খামার স্থাপনের নিবন্ধন প্রাপ্তির আবেদনপত্র  
[বিধি-১৮ দ্রষ্টব্য]

বরাবর,  
জেলা প্রাণিসম্পদ কর্মকর্তা,  
.....  
..... ।

জনাব,  
আমি/আমরা নিম্নস্বা রকারী ব্যক্তি/ব্যক্তিবর্গ/কোম্পানী গরু/মহিষ/ছাগল/ভেড়া সহ বিভিন্ন স্তন্যপায়ী প্রাণীর স্থাপন পরিচালনা করতে আগ্রহী। সংশ্লিষ্ট বিষয়ে প্রচলিত সরকারী নীতিমালা ও শর্তাবলী পালনে অঙ্গীকারবদ্ধ।

- |     |  |   |
|-----|--|---|
| ১।  | আবেদনকারী ব্যক্তি/প্রতিষ্ঠানের নাম   | : |
| ২।  | ঠিকানা   | : |
|     | (ক) স্থায়ী  | : |
|     | (খ) বর্তমান  | : |
| ৩।  | গরু/মহিষ/ছাগল/ভেড়ার সংখ্যা  | : |
| ৪।  | স্থাপনকাল (স্থাপনা চলমান হলে) বা সম্ভাব্য স্থাপনকাল<br>(প্রতিষ্ঠানটি চলমান না হলে) | : |
| ৫।  | খামারের অবস্থান ও ঠিকানা   | : |
| ৬।  | বর্তমানে কার্যক্রম চলমান কি না, হইলে চালুর তারিখ                                   | : |
| ৭।  | চলমান না হইলে সম্ভাব্য চালুর তারিখ   | : |
| ৮।  | লে-আউট প্লান   | : |
|     | (যে ে ত্রে সংগ্রহ করা হয় নাই সেে ত্রে সংগৃহীতব্য প্লানের বিবরণ)                   | : |
| ৯।  | খামারের ধরণ  | : |
|     | (ক) গরুর খামার (ডেইরী/মাংস) (খ) মহিষের খামার (গ) ছাগলের খামার :                    |   |
|     | (ঘ) ভেড়ার খামার (ঙ) অন্যান্য (উল্লেখ করতে হবে)।                                   |   |
| ১১। | জনবল কাঠামো  | : |
| ১২। | নির্মাণ  | : |
| ১৩। | পরিকল্পিত নির্মাণের বর্ণনা   | : |
| ১৪। | বায়োসিকিউরিটির ব্যবস্থার ধরন  | : |
| ১৫। | রোগের রেকর্ড সংর ণের পদ্ধতি  | : |
| ১৬। | বর্জ্য অপসারণের ব্যবস্থাপনার ধরন   | : |

আবেদনকারীর স্বা র  
তারিখ :

Appendix 7:

নিবন্ধন প্রদানের মতাপ্রাপ্ত কর্মকর্তা  
[বিধি-১৮ দ্রষ্টব্য]

স্থাপনার ধরণ	যাহার নিকট নিবন্ধনের আবেদন করিতে হইবে।
১. পশু হাসপাতাল	পরিচালক (পশুস্বাস্থ্য ও প্রশাসন) পশুসম্পদ অধিদপ্তর, বাংলাদেশ ঢাকা।
২. রোগ নির্ণয় গবেষণাগার	পরিচালক (পশুস্বাস্থ্য ও প্রশাসন) পশুসম্পদ অধিদপ্তর, বাংলাদেশ ঢাকা।
৩. শুক্রানু সংগ্রহ ও প্রক্রিয়াজাতকরণ কারখানা	পরিচালক (সম্প্রসারণ) পশুসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
৪. পশুজাত পণ্য প্রক্রিয়া জাতকরণ কারখানা	পরিচালক (পশুস্বাস্থ্য ও প্রশাসন) পশুসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
৫. পশুর খামার	
(ক) হাঁস-মুরগী খামার	
(১) গ্রান্ড প্যারেন্ট স্টক খামার	মহাপরিচালক, পশুসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
(২) প্যারেন্ট স্টক খামার	সংশ্লিষ্ট জেলা পশুসম্পদ কর্মকর্তা।
(৩) বাণিজ্যিক খামার	সংশ্লিষ্ট জেলা পশুসম্পদ কর্মকর্তা।
(খ) গবাদি পশু খামার	
(১) গরু বা ষাঁড়, পাঁঠার দাতা গাভী বা ছাগীর খামার (প্রজনন)	সংশ্লিষ্ট জেলা পশুসম্পদ কর্মকর্তা।
(২) গবাদিপশুর বাণিজ্যিক খামার	সংশ্লিষ্ট জেলা পশুসম্পদ কর্মকর্তা।
(৩) অন্যান্য খামার	মহাপরিচালক, পশুসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।

Appendix 8:

dig 9

নিবন্ধন সনদপত্র :  
[বিধি-১৮ দ্রষ্টব্য]

নিবন্ধন নং ..... তারিখ .....

জনাব/মেসার্স .....এর ..... তারিখের আবেদনের প্রেি তে  
.....কে .....স্থাপন ও  
পরিচালনার জন্য নিবন্ধন প্রদান করা হইল।

এই নিবন্ধনের মেয়াদ ..... তারিখ পর্যন্ত কার্যকর থাকিবে এবং প্রতি বৎসর ৩১ মার্চের মধ্যে নবায়ন  
করিতে হইবে।

নিবন্ধন প্রদানকারী ভেটেরিনারি কর্মকর্তার  
স্বা র ও সীল

তারিখ : (দাপ্তরিক সীল)

নবায়ন তারিখ

ও কর্মকর্তার স্বা র

Appendix 9:

Semen Collection and Artificial Insemination in Poultry

## **1. Semen collection from poultry**

### **A. Semen collection procedure**

1. A small, 60-degree angle, glass funnel fitted with a one-hole rubber stopper for gripping is taken, the part of the stem of the funnel below the stopper is cut off and filled the remaining end with paraffin to close the opening of the stem.
2. Two members should be involved in semen collection- one for restraining the male, the assistant and the other for collecting semen, the manager.
3. Time for semen collection from a male requires 2 min, if the male is handled regularly.
4. Restrain the male bird and hold it in a horizontal position by an assistant at a height convenient to the manager who is attempting to collect the semen.
5. Place the manager's thumb and index finger of the left hand on either side of the cloaca and massage gently.
6. Clean the cloaca with cotton using the fingers of the right hand of the manager.
7. Hold the collecting funnel with the manager's thumb and index finger of the right hand.
8. Massage the soft part of abdomen below the pelvic bones and stroke gently the back of the bird over the testes by the assistant to stimulate the bird and continue the actions until the male protrudes the papilla from the cloaca.
9. After papilla is fully protruded, squeeze the cloaca through the external papillae by the previously positioned manager's thumb & index finger to collect the semen into funnel.
10. In contrast, the penis of the duck unexceptionally elongates outside the vent and shows some stiffness following stimulation by massage.
11. Press the stiff penis by the fingers of the left hand and collect the semen in the funnel.

### **B. Preparation and transport of semen**

1. Collected semen is usually pooled and inseminated with fresh semen.
2. Chicken and turkey semen begin to lose fertility when stored for longer than 1 hour.
3. Liquid cold storage at 4°C of turkey and chicken semen can be used to transport and maintain sperm viability for ~6–12 hours (common in turkey semen not in others).
4. When using liquid cold storage for more than 1 hour, turkey and chicken semen must be diluted with a semen extender at least 1:1 ratio (then the turkey semen is agitated slowly at 150 rpm to facilitate oxygenation, but that is not needed for chicken semen).
5. Modified Ringer's solution with the composition of sodium chloride (68g), potassium chloride (17.33g), calcium chloride (6.42g), magnesium sulphate (2.50g), sodium bicarbonate (24.50g) and distilled water to make it 10 liters, used to dilute bird semen.
6. Dilution results in an insemination dose containing ~100–200 million viable spermatozoa for chicken.
7. Diluted semen must be stored at 4°C in the refrigerator.
8. Cryopreservation of the poultry semen is also possible.

## **2. Artificial Insemination in Poultry**

### **A. Artificial insemination procedure**

1. Hold the female upright, press the abdomen around the vent on the left side resulting the cloaca to evert and the oviduct to protrude.
2. Insert ~1 inch or 2.5 cm of the glass tube, syringe or plastic straw containing the appropriate amount of semen into the oviduct and deliver the semen properly.
3. Once the semen is expelled into the oviduct by the inseminator, pressure around the vent is released, which assists the hen in retaining sperm in the oviduct.
4. Release the female bird to the pen.

**B. After completion of AI procedure**

1. After deposition of semen in the oviduct the semen will enter the sperm storage gland, situated at the junction of the vagina and the shell gland, sperm storage tubules (SST).
2. Then the spermatozoa will make their way up the oviduct to the SST of a second storage site situated at the junction of the magnum and infundibulum.
3. The passage of an ovum into the infundibulum stimulates spermatozoa activity and fertilization of the ovum by one sperm takes place.
4. Spermatozoa can survive in the SST for up to 2-15 weeks in chickens, ducks, turkeys and quails depending on the species.
5. However, spermatozoa are able to live in the SST for at least 5-11 days in chicken, ducks and geese, and three weeks in turkeys.

**Appendix 10:**

**Recommended Stocking Density of Layer Breeder Chicken**

Rearing System	Day old to 2 weeks		2 to 5 weeks		6 weeks to transfer		In production	
	Temperate climate	Hot climate	Temperate climate	Hot climate	Temperate climate	Hot climate	Temperate climate	Hot climate
Floor system	20 birds/m <sup>2</sup>	20 birds/m <sup>2</sup>	15 birds/m <sup>2</sup>	12-15 birds/m <sup>2</sup>	10 birds/m <sup>2</sup>	8 birds/m <sup>2</sup>	8 birds/m <sup>2</sup>	6 birds/m <sup>2</sup>
Cage system	130 cm <sup>2</sup> /bird	140 cm <sup>2</sup> /bird	220 cm <sup>2</sup> /bird	250 cm <sup>2</sup> /bird	350 cm <sup>2</sup> /bird	390 cm <sup>2</sup> /bird	750 cm <sup>2</sup> /bird	800 cm <sup>2</sup> /bird

(Beneventi, 2021)

**Appendix 11:**

**Recommended Temperature for Layer Breeder Chicken**

	<b>Under the brooder</b>	<b>Near the circular guard</b>	<b>Room temperature</b>	<b>Temperature in cages</b>
Before arrival (2-3 days)	30°C	30°C	30°C	35°C
Before arrival (1 day)	35°C	35°C	35°C	35°C
Week 1	35-33°C	32-31°C	30-28°C	30-28°C
Week 2	32°C	30-28°C	28-26°C	28-26°C
Week 3	28°C	28-26°C	26-24°C	26-24°C
Week 4	-	-	22-20°C	22-20°C
Week 5	-	-	22-20°C	22-20°C
Week 6	-	-	20-22°C	21-19°C
Week 7	-	-	22-20°C	21-19°C
Week 8	-	-	21-19°C	20-18°C
Till transfer	-	-	20-18°C	19-17°C

(Beneventi, 2021)

## Appendix 12:

### Feeder and waterer space requirements for Chicken

Types of birds	Weeks of Age	Linear inches of trough	
		Feeder/bird	Waterer/100 birds
Brooding	0-4	1.5	24
Growing	4-12	2.5	48
Roasters	8-12	2.5	48
	12-16	3	48
Replacements	8-12	3	48
	12-21	4	60
Layers			
Light weight type	21+	4	60
Heavy weight type	21+	4	60

(Adapted from Enos, 2018)

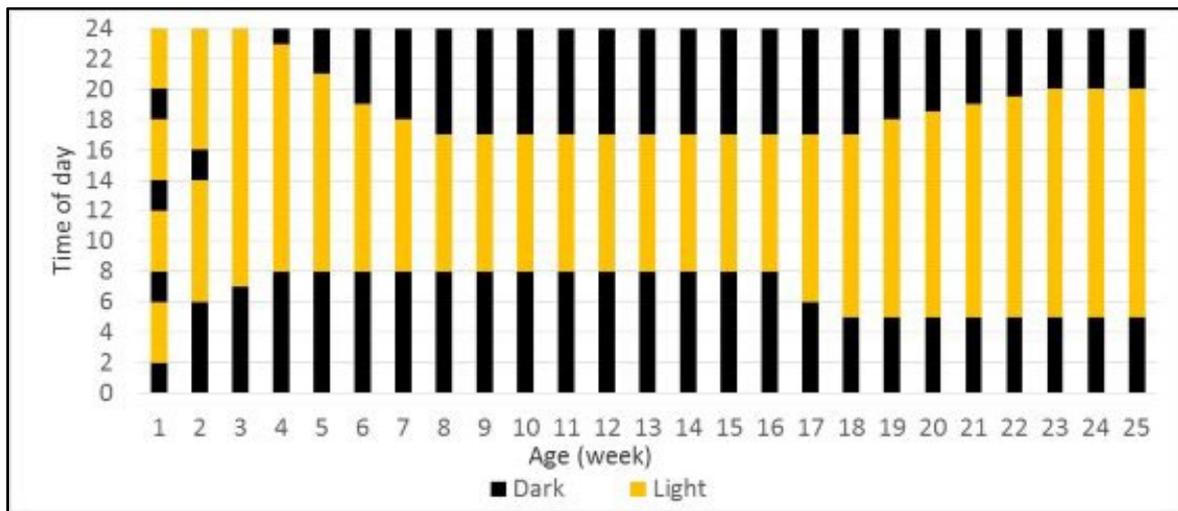
**Appendix 13:****Nutrient Requirements Layer Breeder of Different Age Groups**

<b>Nutrients</b>	<b>Chick (0-8 wks)</b>	<b>Grower (9-15 wks)</b>	<b>Pre-layer (16-18 wks)</b>	<b>Layer Phase-1 (19-34 wks)</b>	<b>Layer Phase-2 (35-72 wks)</b>
Protein (%)	20.00	17.00	17.00	19.00	17.50
M.E. (Kcal/kg)	2750	2550	2550	2550	2500
Linolenic acid (%)	1.40	0.10	1.20	1.40	1.20
Lysine (%)	1.10	0.80	0.80	0.88	0.75
Methionine (%)	0.50	0.40	0.45	0.50	0.40
Methionine +Cystine (%)	0.75	0.60	0.65	0.73	0.62
Calcium (%)	1.10	1.10	2.50	3.80	4.00
Available Phosphorus (%)	0.45	0.45	0.45	0.45	0.42
Sodium (%)	0.20	0.18	0.20	0.20	0.20
Vitamin A (IU/kg)	20,000	16,000	20,000	20,000	20,000
Vitamin D (IU/kg)	4,000	3,200	4,000	4,000	4,000
Vitamin E (mg/kg)	60	40	60	60	60
Vitamin K (mg/kg)	4.00	3.20	4.00	4.00	4.00
Riboflavin (mg/kg)	20	50	20	20	0

(TNAU, 2022b)

**Appendix 14:**

**Recommended Lighting Program in Light-Controlled Rearing and Laying Houses**



(Beneventi, 2021)

**Appendix 15:****Layer Breeder Chicken Stock Performance Potential Traits**

<b>Traits</b>	<b>Male</b>	<b>Female</b>
Body weight (g) at 4 weeks of age	300	250
Body weight (g) at 8 weeks of age	725	580
Body weight (g) at 12 weeks of age	1100	850
Body weight (g) at 16 weeks of age	1350	1100
Body weight (g) at 20 weeks of age	1550	1300
Body weight (g) at 40 weeks of age	2000	1600
Body weight (g) at 72 weeks of age	2300	1700
Flock uniformity	>80%	>80%
Feed intake (kg) 0-8 weeks	3.0	2.5
Feed intake (kg) 9-20 weeks	4.5	4.0
Feed intake (kg) 0-20 weeks	7.5	6.5
Feed intake (kg) 20-72 weeks	38.0	40.0
Layer feed/hatching egg (g)	145	
Total feed/hatching egg (g)	188	
Mean livability (%) 0-20 weeks	94	
Mean livability (%) 21-72 weeks	92	
Mean mortality (%) 0-72 weeks	14%	
Hen housed egg number (20-72 weeks of age)	280	
% Total hatchability	90	
Saleable pullet chicks/hen housed	110	

(TNAU, 2022b)

**Appendix 16:****Nutritional Requirements for Commercial Chicks (Chick Mash)**

<b>Nutrient</b>	<b>Requirement</b>
Metabolizable Energy (ME)	2800 kcal/kg (minimum)
Crude Protein (CP)	20% (minimum)
Crude Fat	5% (maximum)
Crude Fiber (CF)	5% (maximum)
Calcium	1% (minimum)
Phosphorus, available	0.45% (minimum)
Lysine	1% (minimum)
Methionine	0.52% (minimum)
Methionine + Cystine	0.86% (minimum)
Threonine	0.78% (minimum)
Tryptophan	0.20% (minimum)

(Akinbobola, 2022)

**Appendix 17:**

**Nutritional Requirements for Commercial Pullets (Grower Mash)**

<b>Nutrient</b>	<b>Requirement</b>
Metabolizable Energy (ME)	2800 kcal/kg (minimum)
Crude Protein (CP)	18.00% (minimum)
Crude Fat	5.00% (maximum)
Crude Fiber (CF)	8.00% (maximum)
Calcium	1.00% (minimum)
Phosphorus, available	0.40% (minimum)
Lysine	1.00% (minimum)
Methionine	0.45% (minimum)
Methionine + Cystine	0.80% (minimum)
Threonine	0.60% (minimum)
Tryptophan	0.20% (minimum)

(Akinbobola, 2022)

**Appendix 18:**

**Nutritional Requirements for Commercial Layer (Layer Mash)**

<b>Nutrient</b>	<b>Requirement</b>
Metabolizable Energy (ME)	2600 kcal/kg (minimum)
Crude Protein (CP)	16.50% (minimum)
Crude Fat	5.00% (maximum)
Crude Fiber (CF)	7.00% (maximum)
Calcium	3.60% (minimum)
Phosphorus, available	0.45% (minimum)
Lysine	0.87% (minimum)
Methionine	0.44% (minimum)
Methionine + Cystine	0.70% (minimum)
Threonine	0.60% (minimum)
Tryptophan	0.20% (minimum)

(Akinbobola, 2022)

**Appendix 19:**

**Nutritional Requirements for Commercial Old Layers**

<b>Nutrient</b>	<b>Requirement</b>
Metabolizable Energy (ME)	2600 kcal/kg (minimum)
Crude Protein (CP)	16% (minimum)
Crude Fat	5.00% (maximum)
Crude Fiber (CF)	7.00% (maximum)
Calcium	4% (minimum)
Phosphorus, available	0.45% (minimum)
Lysine	0.87% (minimum)
Methionine	0.44% (minimum)
Methionine + Cystine	0.66% (minimum)
Threonine	0.60% (minimum)
Tryptophan	0.18% (minimum)

(Akinbobola, 2022)

**Appendix 20a:**

**Nutritional Requirements of Broiler Chicks (Starter)**

<b>Nutrients</b>	<b>Requirements</b>
Metabolizable Energy (ME)	3000 kcal/kg
Crude Protein (CP)	21-22%
Crude Fat	5% (max)
Crude Fiber (CF)	5% (max)
Calcium	0.85% (min)
Phosphorus, available	0.45% (min)
Lysine	1.10% (min)
Methionine	0.37% (min)
Methionine + Cystine	0.88% (min)
Threonine	0.77% (min)
Tryptophan	0.18% (min)

(Akinbobola, 2022)

**Appendix 20b:**

**Nutritional Requirements of Broilers (Grower)**

<b>Nutrients</b>	<b>Requirements</b>
Metabolizable Energy (ME)	3050 kcal/kg
Crude Protein (CP)	19-20%
Crude Fat	5% (max)
Crude Fiber (CF)	8% (max)
Calcium	0.80% (min)
Phosphorus, available	0.45% (min)
Lysine	1.05% (min)
Methionine	0.33% (min)
Methionine + Cystine	0.80% (min)
Threonine	0.69% (min)
Tryptophan	0.17% (min)

(Akinbobola, 2022)

**Appendix 20c:**

**Nutritional Requirements of Broiler (Finisher)**

Nutrients	Requirements
Metabolizable Energy (ME)	3100-3200 kcal/kg
Crude Protein (CP)	18-19%
Crude Fat	6% (max)
Crude Fiber (CF)	8% (max)
Calcium	0.80% (min)
Phosphorus, available	0.45% (min)
Lysine	0.95% (min)
Methionine	0.30% (min)
Methionine + Cystine	0.74% (min)
Threonine	0.65% (min)
Tryptophan	0.17% (min)

(Akinbobola, 2022)

**Appendix 21:**

**Basic Nutrition Requirement for Breeder Ducklings and Breeder Layer Ducks**

Nutrient	Amount
<b>Developer Feed:</b>	
Crude protein %	15.5
Metabolizable energy (kcal/kg)	2,932
Calcium (%)	1.0
Available phosphorus (%)	0.5
Lysine (%)	0.72
Methionine + cystine (%)	0.51
<b>Breeder Layer Feed:</b>	
Crude protein %	19.0
Metabolizable energy (kcal/kg)	2,866
Calcium (%)	3.3
Available phosphorus (%)	0.42
Lysine (%)	1.0
Methionine + cystine (%)	0.66

(Linden, 2014)

**Appendix 22:**

**Target Weights and Feeding Schedules for Duckling and Breeder Layer Ducks**

Age (weeks)	Body weight (Kg)		Feed (kg/100 ducks)
	Females	Males	
0	0.05	0.06	Continuous: Developer diet
1	0.09	0.11	5.90 every other day
2	0.23	0.25	5.90 every other day
3	0.45	0.50	6.80 every other day
4	0.82	0.91	6.80 every other day
5	0.95	1.02	7.71 every other day
6	1.22	1.36	7.71 every other day
7	1.59	1.81	9.53 every other day
8	2.06	2.27	9.53 every other day
9	2.15	2.36	10.43 every other day
10	2.21	2.46	10.43 every other day
11	2.28	2.58	10.89 every other day
12	2.34	2.60	10.89 every other day
13	2.41	2.68	10.89 every other day
14	2.48	2.77	10.89 every other day
15	2.51	2.83	10.89 every other day
16	2.55	2.88	10.89 every other day
17	2.59	2.92	10.89 every other day
18	2.63	2.96	10.89 every other day
19	2.67	3.05	10.89 every other day
20	2.71	3.13	10.89 every other day
21	2.75	3.18	10.89 every other day
22 (Begin 14 h light/day)	2.80	3.24	11.34 every other day (Breeder diet)
23	2.84	3.28	11.34 every other day
24 (Begin 16 h light/day)	2.88	3.32	12.25 every other day
25	2.91	3.36	12.25 every other day
26	2.95	3.40	14.51 every day
27			14.51 every day
28			16.33 every day
29			16.33 every day
30 to 39			18.14 every day
40 to 43			20.41 every day
44 to end of laying cycle			21.77 every day

(Linden, 2014)

## Appendix 23:

## Drinking Water Quality Guidelines for Poultry

Contaminant/ Mineral/ion	Average Level	Maximum Level	Remarks
<b>Bacteria</b>			
Total bacteria	0 CFU/mL	100 CFU/mL	0 CFU/ml is desirable
Coliform bacteria	0 CFU/mL	50 CFU/mL	0 CFU /ml is desirable
<b>Acidity and hardness</b>			
pH	6.8 to 7.5	6.0 to 8.0	A pH of less than 6.0 is not desirable. Levels below 6.3 may degrade performance.
Total hardness	60 to 180 ppm	110 ppm	Hardness level <60 ppm is unusually soft; that >180 ppm is very hard.
<b>Naturally occurring elements</b>			
Calcium (Ca)	60 mg/L	-	
Chlorine (Cl)	14 mg/L	250 mg/L	Levels as low as 14 mg/L may be detrimental if the sodium level is higher than 50 mg/L.
Copper (Cu)	0.002 mg/L	0.6 mg/L	Higher levels produce a bad odor and taste.
Iron (Fe)	0.2 mg/L	0.3 mg/L	Higher levels produce a bad odor and taste.
Lead (Pb)	0 mg/L	0.02 mg/L	Higher levels are toxic.
Magnesium (Mg)	14 mg/L	125 mg/L	Higher levels have a laxative effect. Levels >50 mg/ml may affect performance if magnesium and chloride levels are high.
Nitrate	10 mg/L	25 mg/L	Levels from 3 to 20 mg/L affect performance.
Nitrite	0.4 mg/L	4 mg/L	
Sulfate	125 mg/L	250 mg/L	Higher levels have a laxative effect. Levels >50 mg/L may affect performance if magnesium and chloride levels are high.
Zinc	0 mg/L	1.5 mg/L	Higher levels are toxic.
Sodium (Na)	32 mg/L	50 mg/L	Levels above 50 mg/L may affect performance if the sulfate or chloride level is high.

(Source: Adapted from T.A. Carter and R.E. Sneed, Drinking water guidelines for poultry. Poultry Science and Technology Guide No. 42, North Carolina State University, USA.)

**Appendix 24:**

**Suitability of Water for Poultry with Different Concentrations of Total Dissolved Solids (TDS)**

TDS (ppm)	Comments
Less than 1,000	These waters should present no serious burden to any class of poultry.
1,000 to 2,999	These waters should be satisfactory for all classes of poultry. They may cause watery droppings (especially at higher levels) but should not affect health or performance.
3,000 to 4,999	These are poor waters for poultry, often causing watery droppings, increased mortality, and decreased growth.
5,000 to 6,999	These are not acceptable waters for poultry and almost always cause some type of problem, especially at the upper limits, where decreased growth and production or increased mortality probably will occur.
7,000 to 10,000	These waters are unfit for poultry but may be suitable for other livestock.
More than 10,000	These waters should NOT be used for any livestock or poultry.

(Source: National Research Council. Nutrients and toxic substances in water for livestock and poultry. National Academy of Sciences, Washington, DC, USA.)

**Appendix 25:**

**3-weeks Heat Calendar for Livestock**

1 Jan	22	12	5	26	16	7	28	18	9	30	20
2	23	13	6	27	17	8	29	19	10	31	21
3	24	14	7	28	18	9	30	20	11	1 Aug	22
4	25	15	8	29	19	10	31	21	12	2	23
5	26	16	9	30	20	11	1 Jun	22	13	3	24
6	27	17	10	31	21	12	2	23	14	4	25
7	28	18	11	1 Apr	22	13	3	24	15	5	26
8	29	19	12	2	23	14	4	25	16	6	27
9	30	20	13	3	24	15	5	26	17	7	28
10	31	21	14	4	25	16	6	27	18	8	29
11	1 Feb	22	15	5	26	17	7	28	19	9	30
12	2	23	16	6	27	18	8	29	20	10	31
13	3	24	17	7	28	19	9	30	21	11	1 Sep
14	4	25	18	8	29	20	10	1 Jul	22	12	2
15	5	26	19	9	30	21	11	2	23	13	3
16	6	27	20	10	1 May	22	12	3	24	14	4
17	7	28	21	11	2	23	13	4	25	15	5
18	8	1 Mar	22	12	3	24	14	5	26	16	6
19	9	2	23	13	4	25	15	6	27	17	7
20	10	3	24	14	5	26	16	7	28	18	8
21	11	4	25	15	6	27	17	8	29	19	so on

Make columns with 21 rows next to each other. Start with writing down the first day on the calendar and continue to write down the first 21 days on the calendar, then go to the top of the next column and continue writing down again. When a cow is seen in heat, write down her number in the cell with the date you saw the cow in heat. For example, on day 9 of the month. Then three weeks later on day 30 look to the left column and see which cows were in heat three weeks ago, so extra attention should be given to these cows when observing them.

**Appendix 26:****Important Reproductive Details/Breeding Guidelines for Cattle and Buffalo**

<b>Particulars</b>	<b>Indigenous</b>	<b>Exotic / Crosses</b>	<b>Buffaloes</b>
Age at puberty	24 months	12-15 months	24-30 months
Age at first mating	30 months	18-20 months	30-36 months
Optimum weight at first mating	250 kg	180-275 kg	300-350 kg
Estrus cycle length	17-24 days	21±3	21 days
Duration of estrus	12-18 hours	12-18 hours	12 -18 hours
Time of ovulation	12-16 hour after end of estrus		
Optimum time of insemination	Mid heat / towards the end of heat		
Gestation period	280-290 days	280 - 290 days	305-318 days
Dry period	80 -90	60 - 70	90 - 120
Calving to first heat	40 days	40 days	40 days
Calving to first service	60 days or less		
Lactation length	Variable	305	Variable
Milk yield in liters	1500-2000	3500-5000	1500-3000
Birth weight	20-25	25-35	30-40

(Adopted from TNAU, 2022a)

**Appendix 27:**

## Nutrient Guidelines for Lactating Dairy Cows

Nutrients	Stage of lactation		
	Early Lactation	Mid Lactation	Late Lactation
Average milk yield (kg/d)	40	30	20
Dry matter intake (kg/d)	24-26	21-23	11-12
Crude protein (% DM)	17-19	15-16	13-15
Ruminal undegraded protein (% CP)	35-40	30-35	25
Soluble protein (% CP)	25-33	25-36	25-40
Neutral detergent fiber (% DM)	30-34	30-38	33-43
Acid detergent fiber (% DM)	19-21	19-23	22-26
Effective fiber (% NDF)	25	25	25
Net energy for lactation (Mcal/kg)	1.64	1.57	1.5
Or, Net energy for lactation (kcal/kg)	1,640	1,570	1,500
Non-fiber carbohydrates (% DM)	30-42	30-44	30-45
Total digestible nutrients (% DM)	72-74	69-71	66-68
Fat (maximum in DM)	5-6	4-6	3-5
Calcium (% DM)	0.8-1.1	0.8-1.0	0.7-0.9
Phosphorous (% DM)	0.5-0.9	0.4-0.8	0.4-0.7
Potassium (% DM)	0.9-1.4	0.9-1.3	0.9-1.3
Sodium (% DM)	0.2-0.45	0.2-0.45	0.18-0.45
Chlorine (% DM)	0.25-0.30	0.25-0.30	0.25-30
Sulfur (% DM)	0.22-0.24	0.20-0.24	0.20-0.22
Cobalt (mg/kg DM)	0.2-0.3	0.2-0.3	0.2-0.3
Copper (mg/kg DM)	15-30	15-30	12-30
Manganese (mg/kg DM)	60	60	50

**Nutrient Guidelines for Lactating Dairy Cows (Contd.)**

	Stage of lactation		
	Early Lactation	Mid Lactation	Late Lactation
Zinc (mg/kg DM)	80	80	70
Iodine (mg/kg DM)	0.8-1.4	0.6-1.4	0.6-1.2
Iron (mg/kg DM)	100	75-100	50-100
Selenium (mg/kg DM)	0.3	0.3	0.3
Vitamin A (1000 IU/day)	100-200	100-200	100-200
Vitamin D (1000 IU/day)	20-30	20-30	20-30
Vitamin E (IU/day)	600-800	400-600	400-600

(Adopted from DAS, 2022)

**Appendix 28:****Nutrient Requirements for Dairy Heifers**

	Nutrients	Heifer Body Weight (kg)			
		150	300	450	600 (240 days Pregnant)
1.	DM Intake (kg/day)	4.2	7.1	11.3	13.0
2.	Crude protein (% of DM)	15.9	12.3	11.0	12.9
2a.	Rumen-undegradable Protein (% of CP)	4.5	2.6	1.4	3.1
2b.	Rumen-degradable Protein (% of CP)	10.4	9.7	9.6	9.8
3.	Total Digestible Nutrients (% of DM)	67.7	63.4	57.7	64.0
4.	Metabolizable Energy (Mcal/kg)	2.45	2.28	2.08	2.31
4.	Or, Metabolizable Energy (Kcal/kg)	2,450	2,280	2,080	2,310
5.	Calcium (% of DM)	0.74	0.50	0.37	0.46
6.	Phosphorus (% of DM)	0.36	0.24	0.18	0.23

(Adopted from NRC, 2001)

**Appendix 29:**

**Calf Milk Replacer (Non-Medicated)**

<b>Composition</b>	<b>Level of composition</b>
Crude Protein	20 to 22.0%
Crude Fat	10 to 25.0%
Crude Fiber	0.10 to 0.15%
Calcium	0.75 to 1.25%
Phosphorus (minimum)	0.7%
Vitamin A, not less than	9,000 IU/kg
Vitamin D3, not less than	600 IU/kg
Vitamin E, not less than	50 IU/lb

(Adapted from NRC, 2001 and Waterman & Mills, 2007)

## Appendix 30:

## Vaccination Schedule for Poultry

Animal	Diseases	Age	Route	Remark
Broilers	Newcastle disease	1-7 days	Spray/oculo-nasal drop	Strain F/BI/LaSota
	Infectious bronchitis	3-4 weeks	Spray/drinking water	Strain La Sota
	Infectious bursal disease	18-21 days	Spray / drinking water	If maternal antibody is low
	Marek's disease	5-10/18-21 days	Drinking water	-
Broiler & layer breeders	Marek's disease	day-1	i/m	If the birds kept for > 60 days during epidemic
	Newcastle disease	day-1 and 3 weeks	i/m	-
		1-7 days	Spray/oculo-nasal drop	If mesogenic strain
		3-4 weeks	Spray/drinking water or i/m	If lentogenic strain (La Sota)
		8 weeks	Drinking water	Killed vaccine/ mesogenic strain
		16-18 and 40th week	i/m drinking water	
	Fowl pox	6-8 & 18-20 weeks	Wing web or i/m	Cell culture vaccine
	Fowl cholera	6 weeks & Adults yearly	0.5 ml s/c and Adults 1 ml s/c	-
	Infectious bronchitis	3, 8 weeks and 14-16 weeks	Drinking water/spray i/m	Killed vaccine
	Infectious bursal disease	3 weeks	Drinking water	At age 5-7 days can be vaccinated with highly attenuated strains if required.
16 weeks		i/m	Killed vaccine	

## Vaccination Schedule for Poultry (Contd.)

Commercial layers	Marek's disease	Day 1	i/m	
	Newcastle disease	1-7 days 3-4 weeks 8 weeks 16-18 weeks	spray/ oculo-nasal drops/drinking water, spray/drinking water, i/m or s/c Drinking water i/m	If mesogenic, If lentogenic, Killed vaccine-mesogenic, La Sota strain
	Infectious bursal disease	40th week	Drinking water	-
	Infectious bronchitis	3 weeks	Drinking water	-
	Infectious coryza	3 weeks	Drinking water	Killed vaccine
	Egg drop syndrome-76 (EDS – 76)	3 weeks	Drinking water/spray	
	Infectious laryngotracheitis	16 weeks	i/m	
Duck breeders/ commercial duck	Duck plague	9 weeks 14-18 weeks 14 weeks	s/c i/m eye drop	Killed vaccine Annual vaccination recommended
	Duck hepatitis	2-4 weeks 8 weeks 16 weeks	i/m or s/c i/m or s/c i/m or s/c Foot web	May be repeated 4-5 months interval
	Duck pasteurellosis (Duck cholera)	9 weeks 1-10 days 20 weeks	i/m	For duck pasteurellosis killed vaccine is to be prepared from duck isolates. Dose same as in chicken
This is an example of a typical vaccination program. Individual programs are highly variable and reflect local conditions, disease prevalence, severity of challenge, and individual preferences.				

(Adapted from TNAU, 2022d)

## Vaccination Schedules for Cattle and Buffalo

Name of Disease	Age at first dose	Booster dose	Subsequent dose
Foot and Mouth Disease (FMD)	4 months and above	1 month after first dose	Six monthly
Anthrax	4 months and above	-	Annually in endemic areas
Hemorrhagic Septicemia (HS)	6 months and above	-	Annually in endemic areas
Black Quarter (BQ)	6 months and above	-	Annually in endemic areas
Brucellosis	4-8 months of age (Only female calves)	-	Once in a lifetime
Theileriosis	3 months or more	-	Once in a lifetime. Only required for crossbred and exotic cattle
Infectious Bovine Rhinotracheitis (IBR)	3 months and above	1 month after first dose	Six monthly
Rabies (Post bite therapy only)	Immediately after suspected bite	4th day	7, 14, 28 and 90 (optional) days after first dose or indicated as per vaccine type

(Adapted from NDDBI, 2022)

## Appendix 32:

## Vaccination Schedules for Sheep and Goat

Name of Disease	Age at first dose	Route	Booster dose	Subsequent dose
Foot and Mouth Disease (FMD)	6-8 weeks	SC or IM depending on vaccine	-	Every 6-9 months
Enterotoxaemia	4 months	2 ml SC	After 15 days (if recommended)	Annually and first 2 doses before August
Anthrax	4-6 months	0.5 ml SC at tail fold	-	Annually in endemic areas
Hemorrhagic Septicemia (HS)	3-4 months	1 ml SC	-	Annually in May/June
Peste des petits ruminants (PPR)	3-4 months	1 ml SC	-	4th year (avoid advanced pregnancy)
Tetanus	3-4 months	0.5-1 ml SC or IM	6 months of age	Annually
Goat pox/Sheep pox	3 months	1 ml IM	-	Vaccinate after kidding/lambing season

(Adapted from Singh, 2011)

## Appendix 33:

## Vaccination Schedules for Pig

Name of Disease	Age at first dose	Route	Booster dose	Subsequent dose
Foot and Mouth Disease (FMD)	6-8 weeks	1 ml SC	-	Every 6-9 months
Swine Erysipelas	6-8 weeks	SC or IM depending on the vaccine	-	Every 6-9 months
Swine Fever	6-8 weeks	1 ml SC	-	Annually
Tetanus	4-6 weeks	1-2 ml SC or IM	12 weeks of age	Annually

(Adapted from Singh, 2011)

## Appendix 34:

## De-worming Schedule for Poultry

Active Ingredient	Susceptible worms	Problem and side effects	Remarks
Piperazine Sulfate	Roundworms only	May become resistant	In poultry, first de-worming should take place from 4-6 weeks of age, then from 12-14 weeks of age and then twice annually.
Levamisole Hydrochloride	Roundworms, Capillaria, Cecal worms	No effect on egg production	
Albendazole	Roundworms, Capillaria, Cecal and tapeworms	No negative effect	
Oxfendazole	Roundworms, Capillaria, Cecal worms	Can settle in water line	
Fenbendazole	Roundworms, Capillaria, Cecal worms	Can settle in water line	
Ivermectine		Can settle in water line Can be used tropically for external parasite	

(Adapted from The Poultry Site: <https://www.thepoultrysite.com/articles/treatment-of-intestinal-worms-in-broiler-breeders>)

## Appendix 35:

## De-worming Schedule for Livestock

Parasite	Anthelmintic	Dose	Route	Remarks
<b>Endoparasites</b>				
Round worms	Piperazine (45mg/100ml)	30ml for cattle, buffalo, calves, sheep & goats	Oral	First dose to be given within 5-6 days of birth Repeat at 45 days intervals
	Tetramisole	5mg/kg body weight	Oral, once	
	Morantel Citrate	10mg/kg body weight	Oral	
	Levamisole	7.5 mg/kg body weight	Oral, once	
Flukes	Oxyclozanide	10-15 mg/Kg body weight	Oral, once	Deworm at 4-6-month interval
	Fenbendazole	7.5 mg/Kg body weight	Oral, once	
	Albendazole	5-10 mg/kg body weight	Oral, once	
	Tricalbebdazole	10-12 mg/kg body weight	Oral, once	
	Rafoxanide	7.5 mg/Kg body weight	Oral	
Tape Worms	Dichlorophen	0.5 mg/kg body weight	Oral	Deworm at 4-6-month interval
	Albendazole	5-10 mg/kg body weight	Oral, once	
	Fenbendazole	5-7.5 mg/kg body weight	Oral, once	
<b>Ectoparasites</b>				
Cattle grubs, lice, horn flies, mange, mites	Ivermectin (1%)	200 mcg/kg body weight	Sub-cut	Twice a year in endemic areas Before and after Monsoon)
	Eprinomectin (5%)	1 mg/kg body weight or 1 ml/110 lbs. body weight	Sub-cut	
	Moxidectin (5mg/ml)	1 ml/10 kg body weight Not for use in veal calves. (Directly apply to the hair and skin in a narrow strip extending along the top of the back from the withers to the tailhead)	Tropical	

(Adapted from MWI-AH, 2016 and KVK, 2022)

## Appendix 36:

## The Basic Techniques of Hoof Trimming in Cattle

**Step 1**

1. Measure about 7.5 centimeters (3 inches) in length from the coronary band to the apex of the claw on the front/dorsal surface of each claw of any of the hind leg.
2. Never trim any claw shorter than this length (3 inches from the coronary band to the apex of the claw on the front/dorsal surface).
3. Cut the inner claw perpendicularly straight at the tip of the toe leaving a square end.
4. The thickness of the toe at the cut end should be 5-7 mm.
5. Do not remove the horn from the heel of the inside hind claw, if so, that will reduce claw angle.

**Step 2**

1. Then cut the outer claw to match the measurement of about 7.5 centimeters/3 inches.
2. Sole should be trimmed flat from front to back remaining 0.25 inch thick at the toe.
3. When the sole is trimmed to the proper thickness, a white line will appear as a ring around the inside of the sole.
4. A properly trimmed sole creates a flat, even & weight bearing surface from toe to heel.
5. During trimming front feet, start with the outer claw first.

**Step 3**

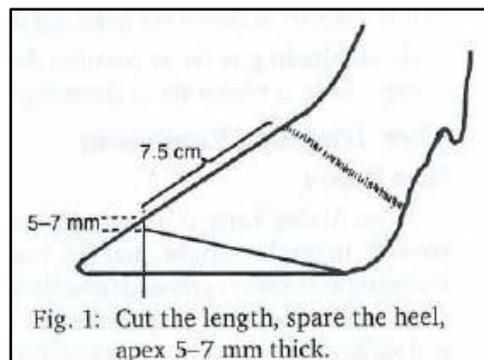
1. Shape the slope of sole with innermost back portion sloping towards the center of claws.
2. Be careful to avoid excessive cupping as it reduces the weight-bearing surface area.

**Step 4**

1. Now begin any therapeutic trimming in regards to lesions.
2. Lesions are generally found in the outer claw of the hind leg.
3. As the inner claw bears more weight, allow the outer claw to rest leaving the apical region the same thickness of the inner claw.
4. If still unable to bear weight, support the inner claw with a block or cowslip.

**Step 5**

1. Pay special attention to save the posterior part of the inner claw as much as possible.
2. Remove the loose horn and trim down all hard ridges.
3. Do not dig into the claw to remove the loose horn and avoid bleeding.



**A Schematic Figure of Hoof Trimming in Cattle** (Courtesy: Trim-Tec Hoof Trimming Tools)

**Appendix 37:**

**Procedure of Shoeing in Animals**

- 1) Cast the animal properly on the soft ground or restrain in a cattle chute.
- 2) Tie at least two hind legs and one fore leg together or tie the respective leg on a pipe when use cattle chute.
- 3) Keep the feet resting on a solid footboard or on a pipe when use cattle chute.
- 4) Remove old worn shoes, if any, following the procedure mentioned below:
  - (a) To remove a shoe knock up the clenches with a buffer and driving hammer.
  - (b) Raise each branch with the pincers, so that the nails are partly drawn out, taking care not to twist the shoe on the foot which may break the wall of the toe.
  - (c) Knock down the shoe with closed pincers.
  - (d) draw out each nail and remove the shoe.
- 5) Clean the sole and clefts with the drawing knife.
- 6) Remove any stumps of nails with the buffer and pincers.
- 7) Cut off loose chips from the lower and outside of wall of hoof with drawing knife.
- 8) If the wall is overgrown it may be reduced by use of toeing knife or hoof trimmer.
- 9) Finally, rasp the hoof to bring the whole of the surface leveled.
- 10) Fitting or nailing the shoes:
  - (a) Place the shoe with one hand on sole and see that it is properly bedded to foot.
  - (b) Drive the nails carefully one by one into the groove of the shoe through the toe wall directing outward.
  - (c) While doing so, if the shoe tends to shift slightly, tap it back into the position.
  - (d) As the nails point through the horny wall of hoof, hammer it down or twist off with the claws of a driving hammer but making it sufficient to form a clench.
  - (e) After all the nails are driven, put the closed jaws of the pincers against the end of the nail on the wall and drive the head of the nail well into the nail hole for proper fixing of the shoe.
  - (f) Finally rub the edge of the rasp round the juncture of shoes and hoof wall to prevent the edge of the wall from splitting.

**Appendix 38:**

**Procedures of Disbudding and Dehorning**

## 1. Disbudding

Disbudding age is usually 15-20 days and can be done using the 'hot iron method' or 'chemical method'.

### **a) Hot iron method-**

- 1) The hot iron method is most popular and commonly used method and a specially designed electric dehorner is used in this method.
- 2) It is a bloodless method and can be used at any season.
- 3) A rod with an automatic control that maintain the temperature, is heated with electricity at about 1000<sup>0</sup>F (537.78<sup>0</sup>C) and is applied to the horn bud for 10 seconds, which is sufficient to destroy horn bud.

### **b) Chemical method-**

- 1) Caustic potash or caustic soda is the common chemical used for disbudding are available in the form of paste or solution, so there is a risk of safety of the eyes.
- 2) The hair around the horn buds and surrounding areas should be clipped and a ring of Vaseline around the horn bud is placed to protect the eyes against chemicals.
- 3) The chemical is rubbed over the buds until bleeding occurs.

## 2. Dehorning

Dehorning is the extraction of grown horn and can be performed using the 'elastrator method' or 'dehorning saw/clippers method'.

### **a) Elastrator method-**

- 1) A specially made thick rubber ring applied to the base of the horn.
- 2) The rubber band shuts off circulation and the horn gradually come off.
- 3) Small buds drop off in 3 to 6 weeks and large horns may take even 2 months.
- 4) It is a painful method and is used on cattle when the horn length is about 5-10 cm.

### **b) Dehorning saw or clippers method-**

- 1) When older cattle are to be dehorned, specially designed clippers or saws are used.
- 2) An appropriate local anesthesia should be used before starting the operation.
- 3) A considerable amount of bleeding may follow the operations.
- 4) To prevent the bleeding the main horn artery should be tied off with a nylon thread.
- 5) Take about half an inch of skin in order to get at the horn roots.
- 6) Cut the skin at the base of the horn.
- 7) Stop bleeding from the cut edge of the skin.
- 8) Start the dehorning sawing or clipping on the root of the horns.
- 9) Pack the horn hole with the pack of tincture iodine-soaked cotton and gauges.

## **Appendix 39:**

### **Components of Plunge Dip, Dipping Procedure, and Its Advantages and Disadvantages**

**A. Components of Plunge dip/tank/vat**

Dipping tanks include 3 basic components:

(1) Approach area/entrance race/collecting yard/collection pen-

- (a) the area is used for holding animals before dipping and should be well drained and firmly founded of concrete, paved to prevent slipping and to prevent accumulation of dung and mud, and narrow enough to allow 1 animal at a time.
- (b) this area should allow about 2 m<sup>2</sup> space per cattle and about 0.5 m<sup>2</sup> space per sheep, goat and pig.
- (c) there should be a water trough for animals to drink before dipping.
- (d) often the approach area comprised of 1 or 2 footbaths to remove dirt, mud and other debris from the animals' feet before they are dipped.
- (e) sometimes, footbath contains CuSO<sub>4</sub> or other suitable chemical solution to control foot-rot disease.

(2) Jump area-

- (a) the jump is a narrow entrance to the dip tank with short steps.
- (b) It should have a design and height to ensure animals' safety and total head wetting.
- (c) it should be inclined with a protruding sill to prevent back-surge of dip wash.

(3) a vat or tank (in which animals are immersed)-

- (a) The dip vat or tank should be constructed on slightly rising ground, close to water source and easily accessible by cattle and operators.
- (b) the tank portion should be constructed of reinforced concrete or some other strong, impervious material that will not crack or leak,
- (c) should be designed to hold a sufficient volume of liquid so that the animals can be immersed completely.
- (d) usually the tank is long enough to ensure that animals leaping from the entrance point cannot jump across the deepest portion of the tank, and is deep enough so that the animals will not injure themselves by hitting the bottom.
- (e) the opposite end of the vat or tank consists of a series of steps to enable animals that have been immersed in vat fluids to walk steadily out of the dipping tank.
- (f) roof is made of corrugated iron sheets to reduce evaporation and dilution of the dip by direct sun and rain water, respectively.
- (g) a wide walkway through the full length of the dip-tank to allow the operator easy, safe access to assist animals in trouble.
- (h) good drainage of the tank area to minimizes flooding in the surrounding areas that could lead to dilution of the dip wash.
- (i) good drainage also reduces soil erosion which causes siltation in the dipping tank.

(4) a drainage area/draining pen-

- (a) the drainage area/draining pen helps in recovery of the excess dip wash back to the dipping tank through a water tight and crack less sloping floor towards the tank.
- (b) the drainage area should be so constructed that excess fluids draining from treated animals will flow back to the dipping vat proper.
- (c) the drainage pen should be of an adequate size to hold 50 plus animals.
- (d) an area of 1.2 m<sup>2</sup> per mature cattle and 0.8 m<sup>2</sup> per sheep, goat and pig should be allowed and they should be held in the pen long enough to allow all the excess fluid to drain from their coats.
- (e) A pipe with stopper shall be installed from the drainage pen to the dip tank.
- (f) an adequate numbers drainage water pipe for removal of rain water from the drainage pen between dipping.
- (g) sometimes, these fluids are routed through a sump tank (a pit or reservoir serving as a drain or receptacle for liquids) where debris, manure, and other materials are removed so that the fluid may return to the dip tank as clean as possible.
- (h) One outlet returns the dip wash back into the dip and is kept open while the dip is in use; the other outlet allows rainwater to escape when the dip is idle.
  - a) sometimes, silt trap outlet is used to trap the mud and dung in the dip wash is trapped as it flows back to the tank from the draining race.
  - b) soaking pit is used for dumping sediments from the dipping tank to ensures no pollution of the environment.

## ***B. Dipping procedure***

### **(1) Before dipping**

- (a) Check water level (full tank)
- (b) Open inlet pipe and close outlet.
- (c) To ensure complete coverage all animals must be dry before dipping

### **(2) During dipping**

- (a) The modern livestock rearing involves regular use of dip to keep animal clean and healthy.
- (b) The size and volume of the dip vary greatly, the primary requirement being that they permit total immersion of the animal.
- (c) Ensure dip is mixed according to manufacturer's instructions, paying attention to correct strengths, premixing and mixing instructions, and maintain a proper concentration at appropriate intervals.

- (d) Under strength dipping is never cost effective and leading to incomplete tick control and resistance.
- (e) Dip tank should be carefully calibrated either by using permanent side markings or using markings on a graduated stick, and if using a graduated stick, it must always be used at the same position in the bath.
- (f) Markings should show the level at which replenishment or 'topping-up' is needed.
- (g) The total volume of the dip tank should be carefully calculated for determining the concentration of the dip.
- (h) Dipping tanks must be managed carefully so that the dips are maintained at the proper concentration and the cattle are dipped properly.
- (i) A plunge dip tank for cattle should typically have a length at water level 10 m and a length at bottom 5 m (due to covering by the ramp) that averaging 7.5 m ( $10 + 5 = 15$ ,  $15 \div 2 = 7.5$ ), average width 0.8 m and depth 2 m resulting in the capacity of ( $7.5 \times 0.8 \times 2$ ) or 12 cubic meters (1 cubic meter contains 1,000 L fluid), so the volume of the tank will be ( $12 \times 1000$ ) or 12 000 L. (or typically 30 feet long, 3 feet wide and 7 feet deep).
- (j) The distance/time of the swim is important and should be at least 30 feet long, 3 feet wide and 4-6 feet deep for goat and sheep for a minute duration in dip.
- (k) Once the volume of the water in the dip tank has been calculated, the amount of the chemical to be added could be accurately calculated as per the manufacturer's directions. [e.g., volume of water is 12 000 L, manufacturer's mixing rate is 1:400, so the amount of chemical needed to be added will be ( $12\ 000 \div 400$ ) or 30 L].
- (l) Topping up or replenishing the dip: after the plunge dip has been used and the level of the mix in it drops, it becomes necessary to replenish with water and chemical.
- (m) The topping up rate varies with chemicals and is always given by the manufacturer [e.g., volume of liquid lost from the dip is 1500 L, Top-up rate is 1:220, so the amount of chemical needed to be added will be ( $1500 \div 220$ ) or 6.8 L].
- (n) Therefore, top up the dip with 6.8 L of chemical and 1,500 L of water in this case.
- (o) Regular testing of the dip-wash by use of a dip-testing kit to keep the dip chemical strength at the correct concentration.
- (p) Clean foot bath before and after dipping, and lock securely the entrance and exit to the dip to prevent access by intruders or stray animals.
- (q) Drain dip wash carefully to avoid the contamination of pastures, nearby water sources and environment.
- (r) Repair cracks in collecting yards, foot baths, dipping tank, silt trap, draining race.

- (s) However, the spread of viral diseases e.g. foot and mouth are possible through dipping of infected animals.
- (t) If dipping a large number of animals, top up the dip with water and chemical after every 400-500 animals have been dipped to maintain efficiency in the dip.
- (u) Animals should be arranged to enter the dip in a single file and dip all the animals the same day according to their ages.
- (v) The treatment/chemicals must be thoroughly mixed by agitating the dip and this can be done effectively by running 20-30 animals through the dip and then returning them to the main herd to be dipped again.
- (w) Make sure the dip is not too dirty and this can render the dip less effective.
- (x) Moving animals through a dip tank can be a laborious process, but its benefit to health and safety on farm animals is undeniable.
- (y) Each animal should drop into the dip tank gently, and are compelled to move through the plunge tank one by one ensuring that the individual animals are totally immersed into the dip and are immersed for an appropriate length of time.
- (z) Submerge each animal in the dipping fluid for at least one minute, and submerge the head at least 2 times.
- (aa) The head should remain above the water for a while to allow for normal breathing, and then be submerged twice with a dipping stick, again allowing time for breathing between dipping.
- (bb) Make sure that the animal is thoroughly wetted, especially the neck folds and the skin at the back of the neck.
- (cc) The animal must be continually checked as it swims through the dip to ensure it does not get into difficulty.
- (dd) Mites, lice will move up the body very quickly and reside in dry areas so it is important that the head is submerged, otherwise re-infestation by ectoparasites (especially lice) occurs quickly.
- (ee) Ensure the animal is breathing comfortably and the animal is not struggling before the head is submerged.
- (ff) A maximum of 500 head should be dipped before replenishing the dip and accurate animal count must be made and recorded.
- (gg) All animals must be submerged completely. If the dip tank is silted up so that animals do not submerge, it must be emptied and cleaned.
- (hh) Keep records of all the animals dipped.
- (ii) When an animal leaves the bath after being dipped, it will take with a considerable volume of dip, a large proportion of which will drain back into the bath (e.g., sheep wool absorbs the chemical from the dip, but the run-off is more dilute than the original wash), and this is the reason why dips need to be replenished or charged.

(3) After dipping

- (a) Close inlet and open outlet pipes.
- (b) Clean collecting pen and drainage pen to prevent buildup of mud and dung.
- (c) Clean footbaths.
- (d) Repair broken pens etc.
- (e) Collect remaining dip and empty dip containers and dispose of them suitably.
- (f) Care is needed in handling and managing freshly dipped animal.
- (g) Dip that drains from freshly dipped sheep should not be allowed to enter streams or other watercourses as it may pollute them and cause fish deaths.
- (h) The animals are allowed into the drying pen.

***C. Advantages and disadvantages***

- (1) The total immersion of the animals means that the acaricide will reach to all body parts-inside the ears, the udder, beneath the tail.
- (2) Very effective to host parasites like mange mites, ticks and lice.
- (3) But it's construction and maintenance are expensive, and less effective against flying parasites like flies and mosquitoes that will not be immersed with the host.

## Appendix 40:

### Components, Spraying Procedure, and Advantages and Disadvantages of Spray Race

#### A. Components of a spray race

- (1) Delivery pipes with nozzles- are made of metal to withstand the pressure of the spray wash, run on the floor, the side walls and overhead, and fitted with nozzles that release the spray wash at appropriate points by joining two suction pipes originating from a reservoir tank.
- (2) The side walls- may be made of concrete blocks or stones or other suitable materials, provide a secure enclosure for the animals being sprayed and prevent the spray drift i.e. being swept away by wind.
- (3) Guard rails- are made of metals and guide the animals through the spray race.
- (4) Control valve- is the valve used to open the delivery pipes for chemicals to flow out.
- (5) Reservoir tank- is the tank which contains the acaricides/pesticides.
- (6) Agitator pipe- that maintains pressure to ensure the chemical is properly mixed.
- (7) Suction pipe- sucks the chemicals under pressure from the reservoir tank and is connected to the delivery pipes.
- (8) Filter mesh- filters any foreign materials from the spray wash draining back into the reservoir tank.
- (9) Pressure gauge- ensures that the machine is operating under correct pressure.
- (10) Drainage pipe- is used to clear the tank.
- (11) Power source- is used to drive the machine and can be obtained from any suitable electricity source.

#### B. Spraying procedure

- (1) Clip the hair in the ears inner surface and tail in order to better wetting.
- (2) Dilute the concentrate of the approved acaricides/pesticides correctly in the reservoir tank.
- (3) Check all components are functioning properly.
- (4) Arrange the animals in a single file as they enter the race.
- (5) Check to ensure that the animals lift their tails as they walk through the length of the tunnel so that under tail wetting takes place.
- (6) The young and new animals should be encouraged to go through the race by lowering the amount of pressure and later increasing the shower pressure.

#### C. Advantages and disadvantages

- (1) It is faster and can spray more animals per hour than a plunge dip, and suitable for pregnant, heavy, young, goat, sheep and sick animals as they do not get shock.
- (2) It is economical and less laborious, and fresh wash can be given at each spraying time.
- (3) No chance of poisoning of animals due to swallowing of the acaricides/pesticides
- (4) But it requires high technical skill in operation and maintenance.
- (5) In wet weather, the nozzles may get clogged with dirt found in the wash.
- (6) It is only economical only with a large herd, and high initial cost of construction.

**Appendix 41:**

**Advantages and disadvantages of  
Topical Treatments/Pour-Ons/Spot-Ons/Back-spraying**

**A. Advantages and disadvantages**

- (1) Pour-ons are easy and convenient to use compared with dipping and spraying.
- (2) Pour-on is a complete deworming by eliminating injection and reducing labor.
- (3) A major advantage is that pour-ons are ready-to-use and don't need to be diluted in water and thus reduces the risk of mistakes when diluting the product.
- (4) Pour-ons also bear less safety risks for the operators than dips or sprays because there is no need to handle products containing highly concentrated pesticides.
- (5) Pour-ons do not create the bothersome problems associated with the disposal of dip wash contaminated with pesticides.
- (6) Pour-ons are more flexible in terms of where and when to treat a herd: it can be done virtually everywhere in a property, e.g. using a portable alley or race.
- (7) Pour-on has less risk of being injured or anything like that and it is suitable for cattle too big to get into the chute or to need to be casted.
- (8) However, when an individual animal is affected with scab or badly affected with maggots and has open wounds, dipping is not advisable, and in such animals, a small quantity of dip is poured along the back, sides and belly of the animals to achieve the objectives of dipping.
- (9) In cattle, a major disadvantage of pour-ons is that coverage of certain body parts (udders, beneath the tail, legs, ears) may be insufficient against some parasites (e.g. several tick and mite species).
- (10) Pour on products are not safe for young calves as they often have a relatively low safety margin and can easily be overdosed (only be used on calves over 120 kg).
- (11) Irritant chemicals that used in pour-ons can be quite irritant, especially to young animals and dairy cows that irritated animals can become restless, which can substantially hinder milking during a few days after treatment.
- (12) Pour-ons are usually more expensive than dips or sprays in product cost per treatment, but if the investment and maintenance costs of dips and spray races are considered, pour-ons may be the more economic option.
- (13) However, Pour-on has been one of the causes of increased resistance to drench products due to the process of back application which once dried allows flies and ticks to become accustomed to the chemical at a low effect level.

**Appendix 42:**

**Advantages and disadvantages of Hand Spraying**

**A. Advantages and disadvantages**

- (1) Hand spraying is the most commonly used method of treating animals with acaricides/ pesticides for the control of ectoparasites in small operations.
- (2) Hand spraying is done by using portable hand sprayers that are easy to use because they are ready made, compact, portable, and lightweight.
- (3) Hand spraying is very cheap and time saving, and the machine is easy to handle.
- (4) Hand spraying is generally less efficient in controlling ticks than immersion in a dipping tank because of problems associated with applying the acaricide/pesticide thoroughly to all parts of the animal's body.
- (5) Hand sprayers are not so powerful and not suitable for large-scale operations.

**Appendix 43:**

**Procedure of Bathing and/or Showering of Livestock**

Although both the bathing and showering of animals are synonymous terms and are performed with the same objectives, and they could be defined separately as:

Bathing- is the process of cleaning and cooling animals with water placing the animal in the natural open water body such as pond, lake, canal, river etc., and the bathing could otherwise be referred as 'traditional bathing', while

Showering is the same process of cleaning and cooling the animals by spreading or sprinkling water through pipes.

However, steps for correct bathing and showering of livestock are-

a) Check the weather-

- (1) Bath or shower livestock only on days with relatively warmer ambient temperature and with a light breeze that can help them dry more quickly, but windy weather could make the animal dusty.

b) Use a safe bathing or showering area-

- (1) Livestock need to be comfortable and feel safe to overcome their nervousness at bath/shower time.
- (2) So, the showering area should be somewhat sheltered and free of potentially abrupt disturbances, and be sure the ground is either concrete or grass to avoid a muddy mess.
- (3) In many areas of the world like Bangladesh, especially in cases of free ranging and backyard rearing system, livestock are bathed in natural open water body by immersing the animal's body into the water.
- (4) But care must be taken about the water quality and the animal safety during the process of bathing.

- c) Socialize/familiarize first-
  - (1) Before starting the bathing or showering, briefly walk or groom the animal to become calm and brushing will also remove dirt, masses or other debris.
- d) Secure the animal-
  - (1) Secure the animal with a halter before bathing or showering and the halter should be loose enough to allow cleaning beneath the halter.
  - (2) Offer hay/straw to keep the animal busy during showering in confined condition.
  - (3) But there is no scope to do so in case of the traditional bathing of animal.
- e) Protect hooves-
  - (1) As the animal's hooves can absorb water and become brittle and cracked, increasing the risk of infection, injury, and discomfort, apply a hoof sealant before beginning the showering to protect the hooves from water to minimize that risk.
  - (2) But there is no scope to protect animal's hooves from absorption of water in case of traditional bathing.
- f) Introduce water-
  - (1) In case of showering, gently aim the water flow of the hose pipe at the animal's front feet to get it accustomed to the spray, then gradually direct the flow higher up on the body and toward the rear areas until it is thoroughly wet.
  - (2) Use a brush or a small bundle of hay or straw to scrap/clean the coat keeping attention for signs of distress or nervousness.
  - (3) But only a small bundle of hay or straw is used in of cases of traditional bathing, where the animal is wet by climbing down into the natural open water body and is scrapped or cleaned by a small bundle of hay or straw in the water.
- g) Shampooing/soaping-
  - (1) After the animal is thoroughly wet, begin manually shampooing or soaping its coat gently in a small section at a time or by using a bubble sprayer or brush starting from the top along the back and way down in case of showering.
  - (2) If necessary, as the shampoo or soap does not dry before being rinsed that makes the coat dull and matted rinse a small amount of water.
  - (3) Generally, shampoo or soap is not used to the animal in case of traditional bathing.
- h) Wash the tail-
  - (1) Use diluted soapy water to soak the tail for 1-2 minutes before massaging the shampoo or soap, then rinse the tail thoroughly in case of showering.
  - (2) Clean around the anus (and vulva in case of female) with a sponge or a piece of soft cloth during showering making sure to remove all debris without causing irritation.
  - (3) In case of traditional bathing, wash the tail with the small bundle of hay or straw and clean around the anus (and vulva in case of female) with the fingers and palm of the animal handler's hand or with a piece of soft cloth.
- i) Wash the head-
  - (1) Wash the animal's head last using excessively diluted shampoo or soap water (to minimize the need for rinsing) and a soft cloth in case of showering.

- (2) Take extra care not to enter any water or shampoo or soap dribble into the eyes, ears, nostrils and mouth.
  - (3) Never submerge the head under water in case of traditional bathing, but the head should be wet by spreading water on the head gently and cleaned by hand or a piece of soft cloth without using shampoo or soap.
  - (4) Care must be taken not to enter water into the eyes, ears, nostrils and mouth, which may cause severe illness, and if the aspiration pneumonia occurs due to introduction of water into the respiratory tract, death may result, especially in case of traditional bathing.
- j) Rinse thoroughly-
- (1) Rinse the animal's coat all along starting on the back and rear parts and finishing at the front legs and be sure all the shampoo/soap is fully removed.
  - (2) There is no scope to rinse the animal, but have the scope of thorough wash the animal in the water in case of traditional bathing.
- k) Consider conditioning-
- (1) Use a conditioner on the coat of animal that to be presented in a show or in the market for sale by gentle massaging before or after rinsing and allow the conditioner to remain for a few minutes, then wiped or soaked the whole body with a soft towel in case of showering.
  - (2) A conditioner may also be used on the coat of animal in case of traditional bathing after completion of washing of animals that to be presented in a show or in the market for sale using the similar manner as mentioned in clause (1).
- l) Dry off-
- In case of showering:*
- (1) Use a sweat scraper to remove excess water from the coat followed by drying the animal with soft towels, or to remove excess water only by a towel.
  - (2) Then walk the animal for several minutes until the coat is fully dry and that will ensure it does not immediately roll and dirty its coat again.
  - (3) Finally, when the animal is dry, turn it out in a clean area that is free of open dirt or excessive dust, or return it to the pen or stall.
- In case of traditional bathing:*
- (1) Use soft towels or soft cloth to remove excess water from the coat of the animal.
  - (2) Dry off the animal following the similar procedures as mentioned in the clause (2) and animal keeping as per similar procedures as mentioned in the clause (3).

Besides bathing and showering, animals, especially cattle are cleaned in following ways:

1. Cleaning and cooling cattle using a sprinkler system
2. Cleaning (and disinfecting or treating) feet using a footbath

**Appendix 44:**

**Cooling and Cleaning of Cows**

**1. Cleaning and cooling cows using a sprinkler system**

Cooling, sometimes along with cleaning, is generally performed in cattle, especially in cows.

**a) Construct a pre-milking wash pen with sprinklers to clean multiple cows.**

- (1) Install sprinklers all along the pen with concrete floor to hold cows before milking.
- (2) Sprinklers should spray both up and down to thoroughly wash the cows.
- (3) Ensure the sprinklers cover the whole pen so all the cows get washed.
- (4) Run cows in lines along the floor of the pen, leaving space in between cows to walk.
- (5) To recycle water, drain it back to a tank to filter and pump back to the system.

**b) Add a sprinkler system to a chute to spray individual cows.**

- (1) Set up footbath in a chute system, so that cows must walk through the footbath and then through the spray system.
- (2) The system should have sprinklers that spray from all angles to clean the cow.
- (3) The sprinkler system should be at least 5 feet long to thoroughly spray the cow.
- (4) Place sprinkler heads in the wall of the chute.
- (5) To recycle water, drain it back to a tank to filter and pump back through the system.

**c) Add a spray curtain to the edge of the shed to clean and cool cows daily.**

- (1) Construct a spray curtain with a pipes and garden sprinklers.
- (2) Attach sprinkler system to the top of the shed, creating a curtain of water between the shed and the yard.
- (3) Water of the spray curtain cleans the cows as they move from the yard to the shed and provides a cooling effect in hot weather and helps to keep flies out of the shed.

There are also different methods of sprinkling for cooling cattle and usually two methods of sprinkling are using in cooling cattle that are:

1. Low-pressure sprinkler method and
2. High-pressure mister method.

## 2. Cooling cattle

- a) Both the low-pressure sprinkler and high-pressure mister methods reduce heat stress through evaporation.
- b) A sprinkler system usually consists of- (i) a pump unit, (ii) tubing- main/submains and laterals, (iii) couplers, (iv) sprinkler head and (v) others - valves, bends, plugs and risers.
- c) Low-pressure sprinklers method
  - (1) Low-pressure sprinklers produce coarse droplets of water and when they drop on the coat of the animal, they reach to the skin.
  - (2) Water is sprinkled onto the cattle, water droplets on the cattle coat absorb heat from the skin and then removes heat by evaporation of the water droplets.
  - (3) Generally, the sprinklers have the water pressure of 10 to 20 lbs. psi (per square inch), should run for 2-3 minutes (or 0.5-3 minutes) and fully 'soak' the cattle coat.
  - (4) The sprinklers should then be turned off for about 15 minutes (or 5-15 minutes) to allow time for evaporative cooling by pulling heat from the coat, just like sweating.
  - (5) Air movement across the wet coat, provided by fans, makes it most efficient.
  - (6) Constant sprinkling with low-pressure sprinkler will not cool cattle due to little evaporation and increasing humidity, and even increasing the water flow rate in low-pressure systems does not have any additional benefits.
  - (7) Grazing cattle using center-swivel sprinklers and spend short periods of time under the swivel sprinklers to cool during summer before moving out to the pasture to evaporate and cool down.
- d) High-pressure misting method
  - (1) The mist sprinkled in air absorbs heat from the air, mist evaporates from the air, and thus lowers the air temperature surrounding the cattle.
  - (2) A water pressure of the mister is about 200 lbs. psi (about 10 times than low pressure sprinkler) is required to create a fine mist that is easily evaporated.
  - (3) High-pressure systems can be run constantly if necessary, as the air is responsible for the evaporating effect.
  - (4) Disadvantages of high-pressure misting method are:
    - (a) The mist can easily be blown away under windy conditions or if used with fans.
    - (b) If a mist builds up on the cattle's hair, it can trap a layer of air between the skin and the water, which holds heat in body and hence the cattle cannot be cooled.
- e) Generally, high-pressure sprinkler systems are more suited to drier and arid parts of the country, with low-pressure systems are preferable in more humid regions.
- f) Water flow rate and pressure, sprinkling duration and interval, sprinkler space interval and nozzle position etc. should be maintained as per manufacturer's instruction.
- g) The ideal water temperature should be at 15-20°C.
- h) Common locations for installing a cooling system are in the holding pen area, where cattle are crowded together, and in the feed line area with the intention to cover the entire yard so that all cattle are wet in a first few minute.

- i) Sprinklers need to be mounted high enough (ideally 2 meters) to project water over the cattle and that will minimize wetting of udders and the risk of mastitis and also prevent water being thrown directly into cattle ears.
- j) Wetting cows immediately after milking must be avoided to prevent teat disinfectant from being replaced with contaminated water while teat orifices are still open.
- k) Pre-wetting the cow yard should be done by hosing, flood washing or sprinkling before 1 hour of their arrival for afternoon milking and that reduces heat stored in the concrete.
- l) Water sprinkling easily increases the relative humidity of cattle barns unless adequate ventilation and air flow is in place to draw in drier air and force out hot and high humid air.
- m) Fans can be placed close to nozzles or in cross-ventilated barns, along the inlet side of the barn that will control the direction of the mist and rate of air-flow.

### **3. Cleaning (and disinfecting or treating) feet using footbath**

- a) The footbath could be made of concrete, plastic or metal.
- b) Plastic footbaths are durable, and easier to remove and clean compared to metal footbaths, but, some chemicals, such as copper sulfate, may react with the metal.
- c) Concrete footbaths having draining facility are permanent and could not be moved.
- d) The footbath should be 6 to 8 inches deep to clean hooves, 3 feet wide to allow single line of cattle to be moved across the bath and 6 to 7 feet long to allow all feet to be immersed into the bath's solution during passing through the bath.
- e) For the most effective foot bathing, 2-bath system should be used- the 1st one contains plain water to wash the hooves, while the 2nd one contains the treatment solution.
- f) Footbath should be placed in an area where the cattle must walk through several times a week or every day.
- g) Cattle just need to walk through the solution, but not need to actively wash their feet.
- h) Footbath solutions vary farm to farm, but the common one is copper sulfate, although other are disinfectants like formalin or organic acids.
- i) Some farms make their own foot bathing solution, but some commercial products are available in the market to be used as footbath solution.
- j) Footbath solution should be chosen as per suggestion of a Registered Veterinarian and be used according to the manufacturer's instructions.
- k) Footbath solution should be cleaned out and changed after each session or every use to be most effective.
- l) When the solution starts to look cloudy, it is the time to change it.
- m) Footbath must be scrubbed thoroughly with detergent and water before refilling it.
- n) Some footbath solutions must not be disposed of by pouring them into the drain, but be needed to be disposed in a slurry system as per manufacturer's instruction.

**Appendix 45:**

**Procedure of Grooming in Livestock**

- a) Disinfect grooming tools and avoid the use of tools from outside the farm, which can increase the risk of disease.
- b) Organize the grooming environment for safety.
- c) Take necessary safety precautions when working with animals (because many activities pose to risk such as inclining over hooves, bending to check legs, repetitive motions in brushing and grooming, reaching above the head for grooming, etc.).
- d) Cross-tie the animal on a clean floor,
- e) Approach the animal first by gently touching the body of the neck is to be groomed.
- f) Start grooming the cattle with a hard brush, but hard brush should not be used in the solid and bony areas of the thin skin, which may cause erosion there.
- g) First groom the neck and then the front half of the body that is sufficient in lapping process.
- h) Touching the feet to groom can cause the animal annoyance during the adaptation phase, but 2-3 steps to the legs is enough to get rid of this type of negative response.
- i) The pressure that can be applied in the use of brushes depends on the animal's body area, skin thickness and brush characteristics.
- j) Take care to groom the sensitive areas of the body (lips, tongue, nipples and vulva are the most sensitive areas in cattle).
- k) Hold the curry comb in the right hand and the brush in the left hand,
- l) Apply curry using gentle and circular motions starting high on the animal's neck behind the ears, and when the neck is curried, use the brush to remove the loosened materials.
- m) Use strokes with curry comb and brush in the direction of the lay of the coat,
- n) Clean one section of the coat at a time and work front to back using first the curry and then the brush to clean each section,
- o) Brush the rump, sides of thighs and buttocks of cows, and only the legs including shoulder and hips of bullocks are brushed using paddy straw or hay whisks,
- p) When the entire first side including the legs is finished, go to the opposite side and repeat the process starting from high on the neck.
- q) Pay attention to areas where harness touches the coat and remove all hardened sweat.
- r) Make use of curry comb for removing sticking dirt and dry dung,
- s) When currying the legs, be very gentle and use the edge of the curry to clean the bony structures around the knees, hocks, elbows, and fetlocks.

- t) Groom the head at last and brush it gently, be sure to loosen the halter and remove any sweat or loose hair caked under the halter,
  - u) Tussle the brush on the curry comb after every 4 to 5 strokes for cleaning,
  - v) Clean all harness and if the harness is caked with sweat and loose hair, it may cause sore,
  - w) Brush against the fall of hair for removing dried mud, dung etc. sticking to hair,
  - x) Use water to loosen material that is sticky or very hard harness,
  - y) Clean the coat with a scraper when the harness is very hard, if necessary,
  - z) If the animal moves, kicks, or attempts to reach back and bite, immobilize it by tightening the crossties and lifting one of the legs,
  - aa) Pick up each hoof and check for stones and remove stones or caked manure with a hoof pick or blunt instrument.
  - bb) Groom cows before milking, and the work bullocks before and after performing work to keep them active and to recover from tiredness and fatigue quicker,
  - cc) Wash their udders with warm water containing an appropriate antiseptic (usually one of the chlorine compounds) and final wiping of udder with boiled damp cloth to remove the surplus water for preventing drop into the milk pail,
  - dd) Remove dust and hairs from the body with a soft brush and complete the grooming by wiping with a towel.
  - ee) Then use a sponge and warm water to remove the finer residue and keep the leather flexible by applying vegetable oil or petroleum once a week,
- Or,
- ff) Use electrically operated mechanical revolving bristle brush and vacuum cleaner for grooming cattle, however, there is an electrically operated revolving bristle brush and vacuum cleaner are used in many areas of the world, but not in wet areas.

## Appendix 46:

### Recommendations for Validation, Approval, Dissemination and Implementation of NG-GLPP

#### 1. Recommendations for Validation of the NG-GLPP

- a) A four or five members review committee can be formed and this committee will review the document and recommend for corrections or, a copy of the NG-GLPP should be supplied to the experts of the livestock sector, stakeholders and the policy makers for their valuable review and comments for corrections.
- b) The NG-GLPP shall be corrected and amended as per logical comments, suggestions and recommendations from the reviewers.
- c) A validation workshop on the NG-GLPP shall be arranged with livestock experts, stakeholders and the relevant DLS officials after the review and subsequent correction.
- d) The NG-GLPP shall be corrected and amended as per logical comments, suggestions and recommendations from the validation workshop.

#### 2. Recommendations for Approval of the NG-GLPP

- a) As the NG-GLPP is a guidelines document, it could be approved by the DG, DLS, Bangladesh, or if the DG, DLS feel necessary, he/she can send it to the Ministry of Fisheries and Livestock, Government of The Peoples' Republic of Bangladesh.

#### 3. Recommendations for Dissemination of the NG-GLPP

- a) The NG-GLPP should be segregated into at least 4 modules, such as-
  - 1) Guidelines for large ruminant management (GLRM),
  - 2) Guidelines for small ruminant management (GSRM),
  - 3) Guidelines for poultry management (GPM), and
  - 4) Food safety guidelines for animal products (FSG)
- b) The segregated documents should be translated into simple Bangla version creating booklets and/or leaflets for easy understanding of the stakeholders
- c) Created Bangla version documents (booklet/leaflet) should widely be distributed among the farmers/stakeholders, even during registration of farm.
- d) Leaflet, poster, banner, online copy, audio-visual content should be created on the NG-GLPP and be made publicity among the farmers/stakeholders.
- e) Publicity could be carried out in collaboration of GO and NGO led by DLS
- f) Three groups of trainers according to the segregated documents (LRM, SRM and PM) should be developed for providing training of other trainers (i.e., ToT)
- g) The respective stakeholders of GLRM, GSRM, GPM and FSG groups should be trained up on the respective guidelines
- h) Multi-stakeholder introductory workshop should be arranged in all administrative divisions of the country.
- i) Training of the respective stakeholders' groups could be done in cooperation of the respective associations like Bangladesh Poultry Industries Central Council (BPICC), Bangladesh Dairy Farmers' Association (BDFA) etc.

#### 4. Recommendations for Implementation of the NG-GLPP

- a) Formulation of a short-, medium- and long-term strategic action plan for the implementation of the NG-GLPP.
- a) Strengthening of DLS regulatory set up and the NG-GLPP should be included under policy formulation and legislation.
- b) Drafting and approval of Acts and Rules on the NG-GLPP by the competent authority to compel and if necessary, to enforce the stakeholder to implement the guidelines.
- c) Preparation and approval of species wise 'Rearing and Management Manual' for proper implementation of guidelines.
- d) Establishment of the respective model demonstration farms/enterprises and thus encouraging the stakeholders.
- e) The NG-GLPP practicing farms/enterprises should be certified by the DLS
- f) The DLS should form Upazila, District, Division and National level Monitoring Team for ensuring practices of the NG-GLPP by the stakeholders.
- g) A separate wing ('NG-GLPP Implementation Wing') could be established in the DLS for regulatory enforcement activity to implement the NG-GLPP.
- h) The DLS 'Monitoring Team' and/or 'NG-GLPP Implementation Wing' could certify the livestock products and their value-added products of the stakeholders those who practicing the NG-GLPP.
- a) Coordination among other related agencies
- b) Conducting regular Mobile Court with law enforcing agencies for ensuring practices of the NG-GLPP in those livestock farms/animal rearing facilities and the related processing enterprises where the guidelines are not practicing by the stakeholders after motivating them several times.
- c) Drafting and approval or amendment of the following acts, rules and policies-

Acts, Rules and Policies	Actions to be taken
1) Animal & Animal Product Quarantine Act, 2005	1) Amendment of the Act
2) Rules of Animal & Animal Product Quarantine Act, 2005	2) Drafting, validation and approval
3) Rules of The Animal Welfare Act, 2019	3) Drafting, validation and approval
4) Rules of The Consumers' Right Protection Act, 2009	4) Drafting, validation and approval
5) Animal Breeding Policy	5) Drafting, validation and approval
6) Animal Breeding Act	6) Drafting, validation and approval
6) National Poultry Development Policy, 2008	6) Amendment of the policy
7) National Livestock Development Policy, 2007	7) Amendment and final approval
8) National Livestock Extension Policy, 2013	8) Final approval of the policy
9) National Dairy Development Policy, 2019	9) Final approval of the policy

#### 4.1. Legal Tools for Implementation of the NG-GLPP

**4.1.1. Existing Legal Tools in Bangladesh for Implementation of NG-GLPP**

Bangladesh belongs to several acts, rules and policies related to livestock, livestock management, livestock derived foods and food safety, and acts on enforcement for the implementation of these acts, rules and policies, which are mentioned below. These acts, rules and policies will help the authority in implementation of the NG-GLPP.

- c) The existing Acts in Bangladesh related to animal diseases, animal feed, animal quarantine, animal slaughter and meat quality, food safety, and animal welfare.
  - 1) The Animal Disease Act, 2005
  - 2) The Bangladesh Animal and Animal Products Quarantine Act, 2005
  - 3) The Consumers' Right Protection Act, 2009
  - 4) The Mobile Court Act, 2009
  - 5) The Fish Feed and Animal Feed Act, 2010
  - 6) The Animal Slaughter and Meat Quality Control Act, 2011
  - 7) The Food safety Act, 2013
  - 8) Bangladesh Biodiversity Act, 2017
  - 9) Bangladesh Standards and Testing Institution Act, 2018
  - 10) Bangladesh Veterinary Council Act, 2019
  - 11) The Animal Welfare Act, 2019
  - 12) Bangladesh Environment Protection Act, 1995
  - 13) The Drugs Act, 1940
- d) The existing Rules in Bangladesh related to animal diseases, animal feed, animal slaughter and meat quality, and food safety.
  - 1) The Animal Disease Rules, 2008
  - 2) The Animal Feed Rules, 2013
  - 3) Food Safety (Food seizure and administration system) Rules, 2014
  - 4) Food Safety (Labeling) Regulations, 2017
  - 5) Food Sample collection, testing and analysis Regulations, 2017
  - 6) Food Safety (Technical Committee) Rules, 2017
  - 7) Use of Food Additives Regulations, 2017-05-09
  - 8) Food Safety (Contaminants, Toxins and Harmful Residues) Regulations, 2017
  - 9) Food Safety (Food Hygiene) Regulations, 2018
  - 10) Food Safety (Food Contact Material) Regulations, 2019
  - 11) The Animal Slaughter and Meat Quality Control Rules, 2021
  - 12) Solid Waste Management Rules, 2021
- e) Approved and draft existing Policies in Bangladesh related to livestock development
  - 1) National Livestock Development Policy, 2007 (Final draft)
  - 2) National Poultry Development Policy, 2008 (Approved)
  - 3) National Livestock Extension Policy, 2013 (Draft)
  - 4) National Dairy Development Policy, 2019 (Final draft)
  - 5) National Drug Policy, 2016 (Approved)
  - 6) Halal standards of Bangladesh (Approved)

## Appendix 47:

## Validation Review Committees

Name of the Committee	Name of the Members	Designation of the Members
A	Dr. A. B. M. Khaleduzzaman	Director, Production, DLS, Dhaka
	Dr. Mohammed Salauddin Khan	Training & Communication Specialist, NATP-2, DLS, Dhaka
	Mr. Md. Sariful Haque	Statistics Officer AI Office, DLS, Dhaka
B	Mrs. Zennat Sultana	Director, Divisional Livestock Department, Dhaka, DLS
	Dr. Hiresh Ranjan Bhowmik	Ex-DG, DLS, Dhaka
	Mr. A. B. M. Salah Uddin	Poultry Nutritionist, Regional Poultry Farm, Rajshahi, DLS, Dhaka
C	Dr. Mohammad Bozlur Rahman,	Deputy Director (L/R), AI-ET Project, DLS, Dhaka
	Dr. Bhabotosh Kanti Sarker	Ex-Director, AI, Dhaka, DLS
	Md. Shane Khoda	SSO, AI Lab, CCBS & DF, DLS, Savar, Dhaka
D	Dr. Bebak Chandra Roy	Poultry Nutritionist Central Poultry Farm, DLS, Dhaka
	Mr. Dipok Kumar Sharker	ULO (L/R), DLS, Dhaka
	Mr. Md. Mojibor Rahman	Assistant Director Production Section, DLS, Dhaka
E	Dr. Nanda Dulal Tikader	Project Director, DLS, Dhaka
	Dr. Arabinda Kumar Saha	Consultant, LDDP, DLS, Dhaka
	Dr. Faisol Talukdar	ULO (L/R), Attached to- Epidemiology Unit, DLS, Dhaka
F	Mr. Rajuana Arefin Khan	Dairy Officer, CCBS & DF, Savar, Dhaka, DLS
	Dr. A. S. S. M. Zubery	Ex-DS, BASF, Ministry of Food
	Dr. Shukesh Chandra Badhy	ULO (L/R), Attached to- CDIL, Dhaka, DLS

Appendix 48:

List of the Participants Nominated by the DLS for the Validation Workshop in the GO

(একই তারিখ ও স্মারকে প্রতিস্থাপিত)  
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
প্রাণিসম্পদ অধিদপ্তর  
মহাপরিচালকের দপ্তর  
www.dls.gov.bd

নম্বর: ৩৩.০১.০০০০.১০১.২৯.০০৩.১৮.৫৩৭

তারিখ: ৩ বৈশাখ ১৪৩০ বঙ্গাব্দ  
১৬ এপ্রিল ২০২৩ খ্রিস্টাব্দ

বিষয়ঃ Bangladesh National Guidelines for Good Livestock Husbandry Practices শীর্ষক Validation Workshop-এ অংশগ্রহণ প্রসঙ্গে।

উপর্যুক্ত বিষয়ের আলোকে জানানো যাচ্ছে যে, প্রাণিসম্পদ অধিদপ্তরের উদ্যোগে এবং Bangladesh Trade Facilitation (BTF) এর কারিগরি ও আর্থিক সহযোগিতায় আগামী ১৭/০৪/২০২৩খ্রিঃ তারিখে Pan Pacific Sonargaon ঢাকায় সকাল ৯.৩০ ঘটিকা হতে দুপুর ১.০০ ঘটিকা পর্যন্ত Validation Workshop অনুষ্ঠিত হবে। উক্ত ওয়ার্কশপে অংশগ্রহণের জন্য প্রাণিসম্পদ অধিদপ্তরস্বীয় নিম্ন বর্ণিত কর্মকর্তাগণসহ অন্যান্য প্রতিষ্ঠানের প্রতিনিধিগণকে অংশগ্রহণের জন্য অনুরোধ করা হলো।

উল্লেখ্য ১৩/০৪/২০২৩খ্রি. তারিখের ৫৩৪ সংখ্যক পত্রটি এতদ্বারা বাতিল করা হলো।

১৬-০৪-২০২৩  
ডাঃ মোঃ এমদাদুল হক তালুকদার  
মহাপরিচালক (চলতি দায়িত্ব)

নম্বর: ৩৩.০১.০০০০.১০১.২৯.০০৩.১৮.৫৩৭/১ (৫৫)

তারিখ: ৩ বৈশাখ ১৪৩০ বঙ্গাব্দ  
১৬ এপ্রিল ২০২৩ খ্রিস্টাব্দ

অবগতি ও প্রয়োজনীয় (প্রয়োজ্য ক্ষেত্রে) ব্যবস্থা গ্রহণের জন্য অনুলিপি প্রেরণ করা হইল (জ্যেষ্ঠতার ক্রমানুসারে নয়):

- ১। মহাপরিচালক, মহাপরিচালক-এর দপ্তর, বাংলাদেশ প্রাণিসম্পদ গবেষণা ইনস্টিটিউট;
- ২। পরিচালক, প্রশাসন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ৩। পরিচালক, হিসাব, বাজেট ও নিরীক্ষা শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ৪। পরিচালক, পরিকল্পনা শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ৫। পরিচালক, কৃত্রিম প্রজনন দপ্তর, প্রাণিসম্পদ অধিদপ্তর;
- ৬। পরিচালক, উৎপাদন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ৭। পরিচালক, সম্প্রসারণ শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ৮। পরিচালক, কেন্দ্রীয় গো-প্রজনন ও দুগ্ধ খামার, সাভার, ঢাকা;
- ৯। পরিচালক, বাংলাদেশ কেন্দ্রীয় মুরগি খামার, মিরপুর, ঢাকা;
- ১০। পরিচালক, বিভাগীয় প্রাণিসম্পদ দপ্তর, ঢাকা;
- ১১। ডীন, ভেটেরিনারি অনুষদ, শেরেবাংলা কৃষি বিশ্ববিদ্যালয় (কর্মশালায় অংশগ্রহণের অনুরোধসহ);
- ১২। উপপরিচালক, প্রশাসন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ১৩। উপপরিচালক, মানব সম্পদ উন্নয়ন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ১৪। উপপরিচালক, লেজিসলেশন, নিবন্ধন ও সার্টিফিকেশন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ১৫। উপপরিচালক, প্রাণিস্বাস্থ্য শাখা, প্রাণিসম্পদ অধিদপ্তর;

List of the Nominated Participants for the Validation Workshop (Contd.)

- ১৬। ড. গোলাম রহমানী, চীফ টেকনিক্যাল কো-অর্ডিনেটর প্রাণিসম্পদ ও ডেইরি উন্নয়ন প্রকল্প (এলডিডিপি);
- ১৭। উপপরিচালক, খামার শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ১৮। জেলা প্রাণিসম্পদ কর্মকর্তা, কুমিল্লা;
- ১৯। ডা. শেখ শাহিনুর ইসলাম, ডেপুটি চীফ ইপিডেমিওলজিস্ট, বিভাগীয় প্রাণিসম্পদ দপ্তর, ঢাকা;
- ২০। ড. মোহাম্মদ বজলুর রহমান, উপপরিচালক, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা;
- ২১। ড. বিবেক চন্দ্র রায়, পোশ্টি নিউট্রিশনিষ্ট, কেন্দ্রীয় মুরগি খামার, মিরপুর, ঢাকা;
- ২২। জনাব এ. বি. এম, সালাহ উদ্দীন, পোশ্টি নিউট্রিশনিষ্ট, আঞ্চলিক মুরগি খামার, রাজশাহী সংযুক্তি; প্রাণিসম্পদ অধিদপ্তর, ঢাকা;
- ২৩। ডাঃ নন্দ দুলাল টিকাদার, প্রকল্প পরিচালক, উত্তরাঞ্চলের সীমান্তবর্তী সুবিধা বঞ্চিত ৮৬ টি এলাকা ও নদী বিধৌত চরাঞ্চলে সমন্বিত প্রাণিসম্পদ প্রকল্প;
- ২৪। জনাব রেজওয়ানা আফরীন খান, ডেইরি অফিসার, কেন্দ্রীয় গো প্রজনন ও দুগ্ধ খামার, সাতার, ঢাকা;
- ২৫। ডাঃ সুকেশ চন্দ্র বৈদ্য, উপজেলা প্রাণিসম্পদ কর্মকর্তা (শীত, ডেপুটেশন এন্ড ট্রেনিং রিজার্ভ পদ), প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা  
সংযুক্তি: সিডিআইএল, ঢাকা;
- ২৬। সহকারী পরিচালক, উৎপাদন শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ২৭। উপজেলা প্রাণিসম্পদ কর্মকর্তা, পরিকল্পনা ও মূল্যায়ন কোষ, প্রাণিসম্পদ অধিদপ্তর;
- ২৮। উপজেলা প্রাণিসম্পদ কর্মকর্তা, পরিকল্পনা শাখা, প্রাণিসম্পদ অধিদপ্তর;
- ২৯। উপজেলা প্রাণিসম্পদ কর্মকর্তা, ইপিডেমিওলজি সেল, প্রাণিসম্পদ অধিদপ্তর;
- ৩০। উপজেলা প্রাণিসম্পদ কর্মকর্তা, মানব সম্পদ উন্নয়ন শাখা, প্রাণিসম্পদ অধিদপ্তর, ঢাকা;
- ৩১। জনাব দীপক কুমার সরকার, উপজেলা প্রাণিসম্পদ কর্মকর্তা, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা;
- ৩২। উপজেলা প্রাণিসম্পদ কর্মকর্তা, নাসিরনগর, ব্রাহ্মণবাড়িয়া;
- ৩৩। জনাব মোঃ শানে খোদা, সিনিয়র সায়েন্টিফিক অফিসার, কৃত্রিম প্রজনন ল্যাবরেটরি, সাতার, ঢাকা;
- ৩৪। ডা. অরবিন্দ কুমার সাহা, পরামর্শক, প্রাণিসম্পদ ও ডেইরি উন্নয়ন প্রকল্প;
- ৩৫। ডা. মোহাম্মদ সালাউদ্দিন খান, ট্রেনিং এন্ড কমিউনিকেশন স্পেশালিস্ট, এনএটিপি-২, প্রাণিসম্পদ অংগ, প্রাণিসম্পদ অধিদপ্তর;
- ৩৬। ডা. মোঃ আবুল কালাম আজাদ, গ্লেবাল হেল্থ সিকিউরিটি স্পেশালিস্ট, ইউএসএআইডি;
- ৩৭। ডাঃ হীরেশ রঞ্জন ভৌমিক, প্রাক্তন মহাপরিচালক, প্রাণিসম্পদ অধিদপ্তর (পিআরএল ভোগরত);
- ৩৮। National Project Coordinator, UNIDO-LDDP, Bangladesh (কর্মশালায় অংশগ্রহণের অনুরোধসহ);
- ৩৯। ডা: ভবতোষ কান্তি সরকার, প্রাক্তন পরিচালক, প্রাণিসম্পদ অধিদপ্তর (পিআরএল ভোগরত);
- ৪০। ডা. এ এস এস এম জুবেরী, উপসচিব (অবসরপ্রাপ্ত);
- ৪১। ডা: মোঃ মাহবুব আলম, ডাইস প্রেসিডেন্ট, কৃষিবিদ ইনস্টিটিউশন বাংলাদেশ;
- ৪২। সভাপতি/ মহাসচিব, বিসিএস লাইভস্টক এসোসিয়েশন (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৩। সভাপতি/ মহাসচিব, বাংলাদেশ ভেটেরিনারি এসোসিয়েশন (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৪। সভাপতি/ মহাসচিব, বাংলাদেশ এনিমেল হাজবেডারি এসোসিয়েশন (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৫। সভাপতি/ মহাসচিব, বাংলাদেশ ডিপ্লোমা লাইভস্টক এসোসিয়েশন (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৬। সভাপতি/মহাসচিব, Bangladesh Poultry Industries Central Council (BPICC) (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৭। সভাপতি/মহাসচিব, Bangladesh Dairy Farmer's Association (BDFa) (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৮। সভাপতি/মহাসচিব, Bangladesh Goat and Sheep Farmer's Association (BGSFA) (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৪৯। সভাপতি/ মহাসচিব, The Vet Executive (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৫০। চেয়ারম্যান, বাংলাদেশ দুগ্ধ উৎপাদনকারী সমবায় ইউনিয়ন লিমিটেড (মিল্ক ভিটা) (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৫১। CEO, Bengal Meat (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৫২। ব্যবস্থাপনা পরিচালক, কাজী ফার্মস লিঃ (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৫৩। ব্যবস্থাপনা পরিচালক, ব্র্যাক লিঃ (একজন প্রতিনিধি প্রেরণের অনুরোধসহ);
- ৫৪। Dr. Eric Brum, Country Team Leader, FAO- (একজন প্রতিনিধি প্রেরণের অনুরোধসহ) এবং
- ৫৫। অফিস কপি, ।



*(Signature)*

১৬-০৪-২০২৩

ডাঃ এমদাদুল হক তালুকদার  
মহাপরিচালক

## Appendix 49:

## Groups of the Validation Workshop

Name of the Groups	Chapters to be Validated	Name and Designation of the Members
<b>Group A:</b> <u>Policy Group</u>	Executive Summary, Chapter I, II & XVI	<ol style="list-style-type: none"> <li>1. Dr. A. B. M. Khaleduzzaman Director, Production, DLS, Dhaka</li> <li>2. Dr. Mohammed Salauddin Khan Training &amp; Communication Specialist, NATP-2, DLS, Dhaka</li> <li>3. Mr. Md. Sariful Haque Deputy Director Farm Section, DLS, Dhaka</li> <li>4. Dr. Md. Mahbub Alam Vice President, KIB, Dhaka</li> <li>5. Director, Accounts, Budget and Audit, DLS, Dhaka</li> <li>6. Director, AI Office, DLS, Dhaka</li> <li>7. Director, Extension, DLS, Dhaka</li> <li>8. Dr. Sk. Shaheenur Islam Deputy Chief Epidemiologist, Divisional Livestock Department, Dhaka, DLS</li> </ol>
<b>Group B:</b> <u>Farm Establishment</u>	Chapter III, IV & V	<ol style="list-style-type: none"> <li>1. Mrs. Zennat Sultana Director, Divisional Livestock Department, Dhaka, DLS</li> <li>2. Dr. Hires Ranjan Bhowmik, Ex-DG, DLS, Dhaka</li> <li>3. Mr. A. B. M. Salah Uddin Poultry Nutritionist, Regional Poultry Farm, DLS, Rajshahi</li> <li>4. Director, Central Poultry Farm, DLS, Mirpur, Dhaka</li> <li>5. District Livestock Officer, Cumilla, DLS</li> <li>6. National Project Coordinator, UNIDO-LDDP, Bangladesh</li> <li>7. Representative Bangladesh Livestock Cadre Association, Dhaka</li> <li>8. Representative Bangladesh Goat and Sheep Farmer's Association</li> </ol>
<b>Group C:</b> <u>General Farm Management</u>	Chapter VI, VII & XI	<ol style="list-style-type: none"> <li>1. Dr. Mohammad Bozlur Rahman Deputy Director (L/R), AI-ET Project, DLS, Dhaka</li> <li>2. Dr. Bhabotosh Kanti Sarker, Ex-Director, AI, DLS, Dhaka</li> <li>3. Md. Shane Khoda, SSO, AI Lab, DLS, Savar, Dhaka</li> <li>4. Deputy Director, Animal Health Section, DLS, Dhaka</li> <li>5. Deputy Director Legislation, Registration and Certification, DLS, Dhaka</li> <li>6. Dean, Veterinary Faculty, Sher E Bangla Agricultural University, Dhaka</li> <li>7. Dr. Golam Rabbani, CTC, LDDP, DLS, Dhaka</li> <li>8. Representative, The Vet Executive, Dhaka, Bangladesh</li> <li>9. Representative, Bangladesh Diploma Livestock Association, Dhaka, Bangladesh</li> </ol>

**Groups of the Validation Workshop (Contd.)**

Name of the Groups	Chapters to be Validated	Name and Designation of the Members
<p><b>Group D:</b> <u>Poultry Farm Management</u></p>	<p>Chapter VIII &amp; IX</p>	<ol style="list-style-type: none"> <li>1. Dr. Bebak Chandra Roy Poultry Nutritionist, Central Poultry Farm, Dhaka, DLS</li> <li>2. Mr. Dipok Kumar Sarkar, ULO (L/R), DLS, Dhaka</li> <li>3. Mr. Md. Mojibor Rahman Assistant Director, Production Section, DLS, Dhaka</li> <li>4. Dr. Avijit Kumar Modak ULO (L/R), Planning Section, DLS, Dhaka</li> <li>5. Upazila Livestock Officer, Nasirnagor, B. Baria</li> <li>6. Representative Bangladesh Animal Husbandry Association, Dhaka</li> <li>7. Representative, BPICC, Dhaka</li> <li>8. Representative, Kazi Farms Ltd., Dhaka, Bangladesh</li> </ol>
<p><b>Group E:</b> <u>Dairy Farm Management</u></p>	<p>Chapter X, XII &amp; XIII</p>	<ol style="list-style-type: none"> <li>1. Dr. Nanda Dulal Tikader, Project Director, DLS, Dhaka</li> <li>2. Dr. Arabinda Kumar Saha, Consultant, LDDP, DLS, Dhaka</li> <li>3. Dr. Faisol Talukdar, ULO (L/R), Epi. Unit, DLS, Dhaka</li> <li>4. Deputy Director, Administration, DLS, Dhaka</li> <li>5. Deputy Director, HRD Section, DLS, Dhaka</li> <li>6. Dr. B. M. Jafar Ahammed ULO (L/R), HRD Section, DLS, Dhaka</li> <li>7. Representative Bangladesh Veterinary Association, Dhaka</li> <li>8. Dr. Eric Brum Country Team Leader, FAO-ECTAD, DLS, Dhaka</li> <li>9. Representative Bangladesh Dairy Farmer's Association, Dhaka</li> </ol>
<p><b>Group F:</b> <u>Foody Safety</u></p>	<p>Chapter XIV and XV</p>	<ol style="list-style-type: none"> <li>1. Mr. Rajuana Arefin Khan Dairy Officer, CCBS &amp; DF, DLS, Savar, Dhaka</li> <li>2. Dr. A. S. S. M. Zubery Ex-DS, BASF, Ministry of Food, Dhaka</li> <li>3. Dr. Shukesh Chandra Badhy, ULO (L/R), CDIL, DLS, Dhaka</li> <li>4. Director, CCBS &amp; DF, DLS, Savar, Dhaka</li> <li>5. Dr. Mohammad Shahadat Hossain ULO (L/R), PEC, DLS, Dhaka</li> <li>6. Dr. Md. Abul Kalam Azad Global Health Security Specialist, US-AID, Dhaka</li> <li>7. Representative, Milk Vita Ltd., Dhaka, Bangladesh</li> <li>8. Representative, Bengal Meat, Dhaka, Bangladesh</li> <li>9. Representative, BRAC Ltd., Dhaka, Bangladesh</li> </ol>

