

# Indian Livestock Farm Management Methodologies: A Survey

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**Abstract:** Agriculture has a good stake in the world's GDP. In many countries, agriculture and allied sectors have a good stake in national GDP. This paper covers details related to livestock since 1960s. The workforce has managed livestock for many decades. The workforce increases as the number of animals increases; it is an energy, time-consuming, and economically costly approach. Apart from it, there is no assurance about animal welfare in case of diseases, breeding, and feed intake issues. In the 21st century of digitalization, technology has a key role in improving overall monitoring, controlling, and processing in livestock management. This paper has gone thoroughly into the manual and automated livestock farm management, aiming welfare of animals, livestock products, consumers' benefit, and sustainable environmental approaches.

**Keywords:** Block chain, Foot and Mouth Disease (FMD), Grazing, Mastitis, Voluntarily Culling.

## 1 INTRODUCTION

Agriculture allied sector includes fishing, dairy, poultry, horticulture, sericulture, hydroponics, aquaponics, etc. Fishing includes marine, aqua, and inland fishing. Dairy includes buffalo, camels, cattle, sheep milk, and processing. Livestock includes dairy, piggy, poultry, etc.

In the traditional grazing management approach, several types were observed: Continuous Grazing, Rotational Grazing, Daily Rotational Grazing, Rotational or Strip or Fold Grazing, Mechanical or Zero Grazing, Green Feeding, or Silage, etc. [1]. Experiments in grazing methods and development studies were carried out in New Zealand [2], Netherlands [3], and United Kingdom [4]. It showed that using electric fencing to ration for open grazing is a better utilization of grass, and farm studies have shown effective improvement in pasture utilization [3][5].

There was a direct relation between farms and livestock. In the 1970s and 1980s, according to Dillon et al., the bulk of Asia and South Asia's small farms were highly integrated. Many products are processed or preprocessed before selling at the farm level in south Asia. For example, in the Sindh area of Pakistan, farmers depend on cattle products like ghee, gur (jaggery), cottonseed, etc., which they use for sale, and a wider form of products are consumed by families than in the case of western farms. Many farmers' livestock can be categorized as dairy cattle for profit, male cattle for status, and sheep and goats are kinds of emergency funds for families [6].

Farm management in a manual way includes inventorying the farm resources, determining the most profitable cropping system, calculating the power and equipment necessary to care for the crops, analyzing feed supplies and planning the livestock system, and calculating the labor required to care for the crops and livestock, summarizing the farm business, and analyzing the earnings and efficiency [7].

In 1957, Trimble R. Hedge et al., in its Farm Manual processing regarding livestock, strongly indicated livestock feed intake supply and planning, labor required for livestock, and further Earning and efficiency analysis. A few decades ago, in manual farming, milk storage cost more than production [8].

Table 1 shows that annual net system returns are comparatively a loss in many parameters and very few are in positive ratio, summarizing overall economic condition is in loss around 10 percent. Region types considered while considering economic data are warm arid, hot arid, and hot humid.

### 1.1 Indian Livestock Breeds Details

Table 2 shows detailed information of various livestock like goat, sheep, cattle, camel, buffalo, duck and fowl etc. their state of existence in India and remark or characteristics.

Table 1: Economic Data for Dairy, Unpaved Lot, Shade, Tractor Scrape, Surface Storage (6 months), Truck Spread, Diversion, Setting Basin, Detention Basin, Runoff Irrigation, 500 Animal Units [8].

Component	Quantity	Capital Investment	Annual Cost (\$/an yr)	Annual Returns (\$/an yr)	Annual Net Systems Return (\$/an yr)
Labor	1343 Hrs	--	9.40	--	-9.40
Tractor	846 Hrs	--	13.50	--	-13.50
Energy	900kw	--	0.10	--	-0.10
Land	500 ft <sup>2</sup> /an	34,433	7.58	--	-7.58
Front end loader	1	2,900	1.08	--	-1.08
Truck spreader / box	1	17,600	8.81	--	-8.81
Diversion Terrace	2800ft	710	0.24	--	-0.24
Detention Basin	1,00,000 ft <sup>2</sup>	6,012	2.18	--	-2.10
Wastewater	1	4,780	3.88	--	-3.88
Concrete sump	1	650	0.22	--	-0.22
Sump pump	1	3,494	2.83	--	-2.83
Nutrient: N	76 lb/an yr	--	--	12.16	+12.16
Nutrient: P <sub>2</sub> O <sub>5</sub>	71 lb/an yr	--	--	12.78	+12.78
Nutrient: K <sub>2</sub> O	141 lb/an yr	--	--	14.10	+14.10
Total	--	70,579	49.90	39.04	-10.76

India's total egg production stood at ~130 billion during 2021-22. In respect to the major stake of states in percent like Andhra Pradesh 20%, Tamil Nadu 16%, Telangana 13%, West Bengal 8%, Karnataka 6%.

## 2 LIVESTOCK HEALTH ISSUES

Livestock are animals that are raised for agricultural purposes such as meat, milk, eggs, and wool. They are susceptible to a range of health issues that can impact their productivity and overall well-being. Some common health issues that affect livestock include the following.

1. Infectious Diseases: Livestock can be affected by various infectious diseases such as bacterial, viral, and fungal infections. These diseases can spread quickly within a herd or flock, leading to significant economic losses and posing a public health threat.
2. Parasitic Infections: Internal and external parasites such as worms, mites, and lice can cause various health problems in livestock, including anemia, weight loss, and reduced productivity.
3. Metabolic Disorders: Livestock can suffer from various metabolic disorders such as ketosis, acidosis, and hypocalcemia. These disorders can be caused by imbalances in the animal's diet or other factors and can lead to various symptoms such as weakness, poor appetite, and poor milk production.
4. Reproductive Disorders: Livestock can suffer from reproductive disorders such as infertility, abortion, and dystocia (difficult labor). These can be caused by various factors such as poor nutrition, infectious diseases, and genetic factors.
5. Respiratory Infections: Livestock can be affected by various viral and bacterial infections that cause respiratory symptoms such as coughing, sneezing, and difficulty breathing.

Table 2. Indian Livestock Breed Details (Continued in next page)

Indian Goat Breeds Details			
Sr. No.	Name of Breed	State	Characteristics/ Remark
1	Gaddi Goat	Himachal Pradesh and J&K	Well adapted in migratory systems, this breed moves in higher altitude in summer
2	Jamunapari Goat	Uttar Pradesh	Best dairy goats in south east asia and tallest in India
3	Changthangi Goat	Jammu & Kashmir	Fine wool and Meat, adapted to the extremely cold weather of the region, which may even go as low as -40 °C
4	Kanni Adu Goat	Tamil Nadu	Name given from both side strips on face
5	Teressa Goat	Andaman & Nicobar Islands	Meat purpose
6	Black Bengal Goat	West Bengal	Small-legged, lustrous hairs
7	Konkan kalyan Goat	Maharashtra	Adapted to hilly tract, heavy rainfall area
8	Chegu Goat	Himachal Pradesh	Pashmina bearing goat
9	Surti Goat	Gujarat	Small folks
10	Assam Hill Goat	Assam, Meghalaya	Short-legged, petite and known to be prolific breeders.
11	Beetal	Punjab	High Milking, fast growth
12	Barbari	Uttar Pradesh	Fast growth rate, hardiness, and adaptability to a range of climatic conditions.
13	Osmanabadi	Maharashtra	Hardiness and meat
14	Sirohi	Rajasthan	Adaptability to arid conditions.
Indian Sheep Breeds Details			
Sr.No.	Name of Breed	State	Remark
1	Coimbatore Sheep	Tamilnadu	Medium size animals
2	Nilgiri Sheep	Tamilnadu	Medium size animals, found in Nilgiri Hills
3	Malpura Sheeps	Rajasthan	Wool used for felts and carpets
4	Patanwadi Sheeps	Gujarat	Coarse fleece
5	Gurez Sheep	Jammu & Kashmir	Good milking potential
6	Magra Sheep	Rajasthan	White and lusturous fleece
7	Pugal Sheep	Rajasthan	Reared for wool
8	Panchali Sheep	Gujarat	Rared for milk production
9	Nali	Punjab	High quality wool and meat
10	Bannur	Karnataka	Meat
Indian Camel Breeds Details			
Sr. No.	Name of Breed	State	Remark
1	Jaislmer Camel	Rajasthan	Racing Potential
2	Bikaneri Camel	Rajasthan	Adaptive to survive in temperature range of 1-49 degree Celsius
3	Kutchi Camel	Gujarat	It can survive without water for 2-3 days
4	Dumple Humped Camel	Ladakh	Adaptive in high altitude and low temperature
5	Malvi Camel	Madhya Pradesh	Milk yielding capabilities
6	Kharai Camel	Gujarat	These are world's only Camel that can swim

Indian Fowl Breeds Details			
Sr. No.	Name of Breed	State	Remark
1	Asseel Fowl	Andhra, Chhattisgarh, Odisha	Majestic gait, high stamina, fighting abilities
2	Ankleshwar Fowl	Gujarat	High stamina
3	Daothigir Fowl	Assam	Majestic gait
4	Danki Fowl	Andhra Pradesh	Fastest growing breed in India

6. Skin Infections: Livestock can be affected by various skin infections caused by bacteria, fungi, and parasites. Symptoms include itching, hair loss, and skin lesions.
7. Environmental Stress: Livestock can be adversely affected by environmental factors such as heat stress, cold stress, and poor air quality. These can lead to various health problems such as dehydration, heat exhaustion, and respiratory distress.

## 2.1 Cattle Health Issues

As per B.J.Conlin, The major management challenges to genetic progress are good reproductive performance, low calf losses, and good herd health. The reasons dairy cows leave herds, as shown in Table 3, indicate which management areas are most important. Approximately 2 out of 3 cows leaving herds are culling involuntarily. Table 3 shows that the major involuntary losses are reproductive problems (26%) and mastitis and udder problems (23%) [9].

Table 3: Reasons for Cows Leaving Dairy Herds

Sr.No.	Culling	Percentage (%)
1	Voluntarily Culling: Low production	32.5%
2	Involuntary Culling:	
a	Reproduction	26.6%
b	Mastitis	10.4%
c	Disease or inabilities	7.7%
d	Teat or udder injury	7.2%
e	Udder Conformation	5.0%
f	Accident and injury	4.0%
g	Type	3.1%
h	Disposition and Milking ease	2.7%

Periodically performed CMTs are an inexpensive and effective way to reduce the risk of subclinical mastitis at the herd level [10]. Farmers' attitudes are a good measure to explain variations in mastitis incidence between farms than farmers' self-reported behavior. They should be considered in future research and animal health promotion [11]. Some policies or regulations should be followed while operating sick cattle. For example, dairy farm owners must not withhold cattle from treatment to maintain their organic status. If organic medication and standards fail or are likely to fail, then appropriate medication and treatment should be followed to restore animal or cattle health [12]. Livestock treated using prohibited material must be marked as different and shall not be labeled, sold, or represented as organic (USDA, 2008).

According to David E. Beever, there is a severe impact on cattle health, fertility, and performance if nutritional feed is controlled in the dry period. A dry period is a part of health recovery after the last lactation. Many vets and nutritionists are working to improve cattle health after the period of calving and fertility. Low energy and high fiber feeding during dry periods will positively impact cattle's health [13].

## 2.2 Buffalo Health Issues

Milk manufacture worldwide has doubled in recent decades; buffalo milk nowadays accounts for around 12% of milk manufactured worldwide. This milk production is concentrated in India and Pakistan and is around 60% and 30% of the overall world production, respectively. Buffalo milk represents 55% and 75% of their total domestic milk production, but it also plays a significant role in the economy of some Mediterranean countries (e.g., Egypt and Italy) [14]. Table 4 shows buffalo calves facing Diarrhea as a major disease followed by endoparasite infestation, ectoparasite infestation, navel ill, pneumonia, etc. Apart from these, some other diseases faced by calves are related to skin, fever, eye infection, hygroma, wounds, lameness, etc.

Table 4. Calves disease pattern in the commercial dairy farm [15]

Sl. No.	Disease	Small n=30	Medium n=30	Large n=30	Total n=90	Rank
1	Diarrhoea	24 (80.0)	30 (100.0)	20 (66.7)	74 (82.2)	I
2	Endoparasite infestation	25 (83.3)	20 (66.7)	27 (90)	72 (80)	II
3	Ectoparasite infestation	20 (66.7)	24 (80.0)	27 (90.0)	71 (78.9)	III
4	Navel ill	21 (70.0)	19 (63.3)	20 (66.7)	60 (66.7)	IV
5	Pneumonia	-	6 (20.0)	10 (33.3)	24 (26.7)	V
Average disease incidence in dairy farms		18 (60.0)	20 (66.7)	21 (70.0)	60 (66.7)	-

Disease and mortality among dairy buffaloes are the problems both in terms of welfare and economic loss [16]. Buffaloes, like all living creatures, are susceptible to various health issues. Here are some of the most common health problems that affect buffalo:

1. Foot and Mouth Disease (FMD): This is a highly contagious viral disease that affects cloven-hoofed animals such as buffalo. Symptoms include fever, blisters in the mouth and on the feet, and lameness.
2. Mastitis: This is an inflammation of the mammary gland, which can be caused by bacterial infections, poor milking practices, or other factors. Symptoms include swelling, pain, and changes in the milk.
3. Parasitic Infections: Buffaloes can be affected by a range of internal and external parasites, including ticks, lice, and worms. These can cause various symptoms such as skin irritation, anemia, weight loss, and diarrhea.
4. Respiratory Infections: Buffaloes can be affected by various viral and bacterial infections, such as pneumonia and tuberculosis. Symptoms include coughing, fever, and difficulty breathing.
5. Reproductive Disorders: Buffaloes can suffer from reproductive disorders such as infertility, abortion, and dystocia (difficult labor). These can be caused by various factors such as poor nutrition, infectious diseases, and genetic factors.
6. Metabolic Disorders: Buffaloes can suffer from various metabolic disorders such as ketosis, acidosis and hypocalcaemia. These can be caused by imbalances in the animal's diet or other factors and can lead to various symptoms such as weakness, poor appetite, and poor milk production.
7. Skin Infections: Buffaloes can be affected by various skin infections caused by bacteria, fungi, and parasites. Symptoms include itching, hair loss, and skin lesions.

## 2.3 Camel Health Issues

Camels are hardy animals that are well adapted to survive in harsh desert environments. However, they are still susceptible to a range of health issues, including:

1. Foot and Mouth Disease (FMD): This is a highly contagious viral disease that can affect camels as well as other cloven-hoofed animals. Symptoms include fever, blisters in the mouth and on the feet, and lameness.
2. Camel Pox: This is a viral disease that causes skin lesions on camels. It is transmitted by mosquitoes and other biting insects.
3. Parasitic Infections: Camels can be affected by a range of internal and external parasites, including ticks, lice, and worms. These can cause various symptoms such as skin irritation, anemia, weight loss, and diarrhea.

4. Respiratory Infections: Camels can be affected by various viral and bacterial infections, such as pneumonia and tuberculosis. Symptoms include coughing, fever, and difficulty breathing.
5. Reproductive Disorders: Camels can suffer from reproductive disorders such as infertility, abortion, and dystocia (difficult labor). These can be caused by various factors such as poor nutrition, infectious diseases, and genetic factors.
6. Metabolic Disorders: Camels can suffer from various metabolic disorders such as ketosis, acidosis, and hypocalcaemia. These can be caused by imbalances in the animal's diet or other factors and can lead to various symptoms such as weakness, poor appetite, and poor milk production.
7. Skin Infections: Camels can be affected by various skin infections caused by bacteria, fungi, and parasites. Symptoms include itching, hair loss, and skin lesions.

## 2.4 Goat and Sheep Health Issues

Goats and sheep are small ruminants that are commonly raised for meat, milk, and wool. They are susceptible to a range of health issues, including:

1. Parasitic Infections: Goats and sheep can be affected by a range of internal and external parasites, including worms, lice, and mites. These can cause various symptoms such as anemia, weight loss, and diarrhea.
2. Respiratory Infections: Goats and sheep can be affected by various viral and bacterial infections, such as pneumonia and contagious ecthyma (a viral infection that causes sores on the lips and around the mouth). Symptoms include coughing, fever, and difficulty breathing.
3. Foot Rot: This is a bacterial infection that affects the hooves of goats and sheep. It can be caused by wet and dirty conditions and can cause lameness and pain.
4. Reproductive Disorders: Goats and sheep can suffer from reproductive disorders such as infertility, abortion, and dystocia (difficult labour). These can be caused by various factors such as poor nutrition, infectious diseases, and genetic factors.
5. Metabolic Disorders: Goats and sheep can suffer from various metabolic disorders such as ketosis, acidosis, and hypocalcaemia. These can be caused by imbalances in the animal's diet or other factors and can lead to various symptoms such as weakness, poor appetite, and poor milk production.
6. Skin Infections: Goats and sheep can be affected by various skin infections caused by bacteria, fungi, and parasites. Symptoms include itching, hair loss, and skin lesions.
7. Urinary Tract Infections: These are bacterial infections that can affect the urinary tract of goats and sheep. Symptoms include painful urination, blood in the urine, and frequent urination.

## 2.5 Poultry and Duck Health Issues

Poultry and ducks are common domesticated birds raised for their meat and eggs. They are susceptible to a range of health issues, including:

1. Respiratory Infections: Poultry and ducks can be affected by various viral and bacterial infections that cause respiratory symptoms such as coughing, sneezing, and difficulty breathing. These infections can spread quickly in a flock, leading to significant economic losses.
2. Parasitic Infections: Internal and external parasites, such as mites, lice, and worms, can cause various health problems in poultry and ducks, including anemia, weight loss, and reduced egg production.
3. Egg Laying Problems: Hens can suffer from reproductive disorders such as egg binding, where an egg gets stuck in the reproductive tract, leading to serious health issues such as infection and death.
4. Nutritional Deficiencies: Poultry and ducks require a balanced diet that provides them with essential nutrients. Nutritional deficiencies can lead to various health problems such as poor growth, weak bones, and feather abnormalities.
5. Fungal Infections: Fungal infections such as Aspergillosis can occur in poultry and ducks, especially in damp and poorly ventilated environments. Symptoms include respiratory distress, reduced appetite, and lethargy.
6. Avian Influenza: This is a viral disease that affects birds and can lead to severe illness and death. It can also be transmitted to humans, posing a public health threat.

Marek's Disease: This is a viral disease that affects young chickens and can cause various symptoms such as paralysis and tumors.

## 3 DEALING WITH LIVESTOCK HEALTH AND WELFARE

Daily exercise of tied cattle feed intake does not affect [17]. New reproductive knowledge and technology improve genetic gain. In the early 1990s, around 70% of cattle breeds were artificial in the USA. Artificial insemination revolutionized dairy cattle breeding and allowed the widespread propagation of superior (and inferior) genotypes [18]. Herd breeding Scheme: multiple ovulation and embryo transfer (MOET) is a breeding scheme to increase the estimated genetic gain by 30% with single-trait selection. Nicholas and Smith propose MOET [19].

Fig. 1 shows a model using Block chain for various operations in a dairy farm ( Dairy cattle breed, milk quantity, date of milking, used vaccines, used feeds, name of the buyer, etc.), collection and transportation (Date and time of collection, location, batch number, milk quantity accepted, quality details, vehicle details, the identity of collector/ quality inspector, etc.), processing (Processing details, manufacturing date and time, product testing, location, quality factors, etc.), packaging (Date and time of packaging, location, packaging details, batch number, etc.), distribution (shipment number, volume, vehicle details, identity of



receivers, order number, quality factors, cargo status, date and time dispatched), retailer (Date and time arrived at retailer warehouse, location, date and time put on the shelf, etc.), consumers, etc. Block chain smart contracts about a match of the farmer, cattle, livestock product details, payment to farmer and match of a supplier, shipment and vehicle details, payment to a supplier.

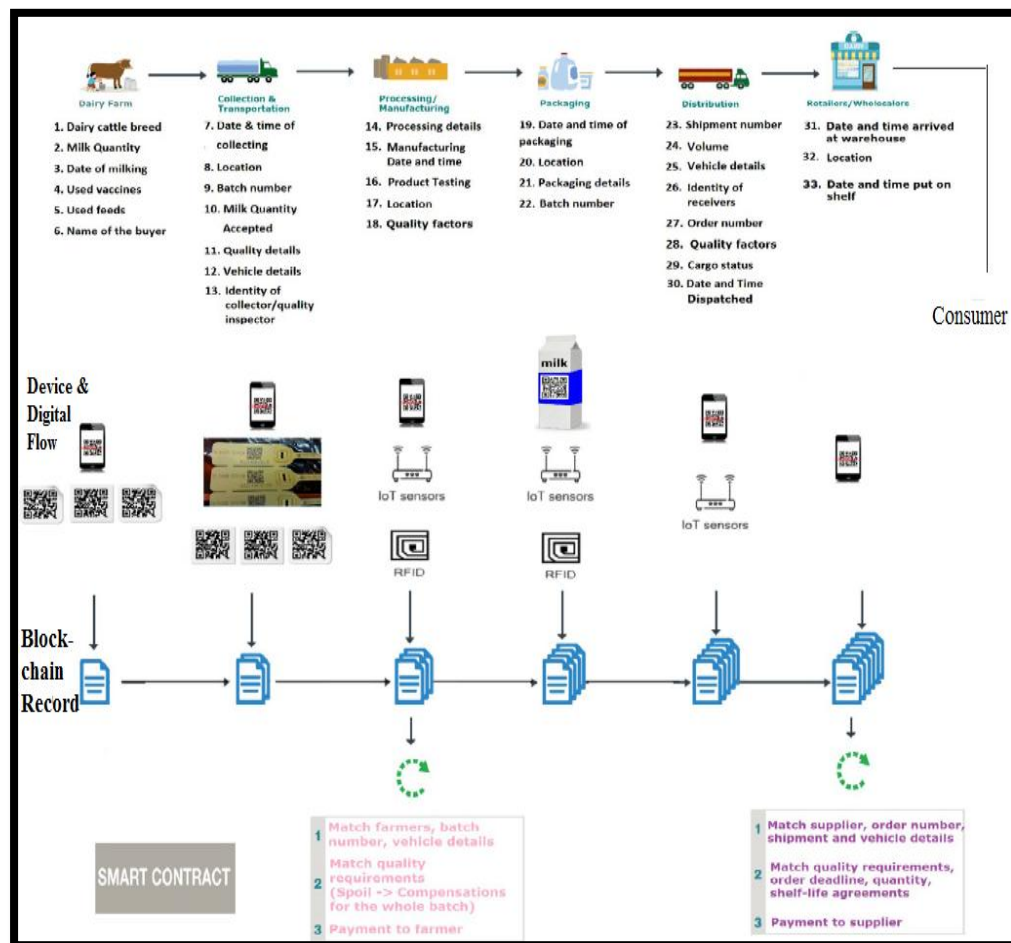


Fig. 1. Framework for a block chain-based traceability system in the Vietnamese dairy supply chain [20].

Wireless sensors are very effective in gathering data for better collection of real-time data from cattle or buffalo on the farm. ZigBee and RFID are useful for collecting data from sensors. IoT devices help pass information about animal health like temperature, heartbeat rate, breathing ketones, grazing rumination, mooing cough, respiratory rate, mastitis, milk quality, lying/standing, activity/mobility behavior.

### 3.1 Best Practices to be Followed in Calf Health Care in Commercial Dairies

1. Feeding arrangement for calves
2. Appropriate housing and bedding
3. Timely treatment of calves
4. Timely de-worming of calves
5. Proper milk feeding to calves
6. Timely colostrums feeding to calves
7. Naval care of calf
8. Dry period antibiotic therapy
9. Colostrums feeding
10. De-worming [21]

### 3.2 Herbal Remedies for Various Diseases for Cattle in India

1. Echinacea - Echinacea is a herb that is traditionally used to boost the immune system and fight infections. It may be used to help treat respiratory infections in cattle.
2. Garlic - Garlic is believed to have antibacterial and antiviral properties. It may be used to help treat respiratory infections, diarrhea, and other infections in cattle.

3. Ginger - Ginger is traditionally used as a digestive aid and may be used to help treat digestive problems in cattle, such as bloat.
4. Aloe Vera - Aloe Vera is a plant that has anti-inflammatory properties and may be used to help treat skin conditions in cattle, such as wounds or burns.
5. Calendula - Calendula is a plant that has antiseptic and anti-inflammatory properties. It may be used to help treat skin infections and wounds in cattle.
6. Milk thistle - Milk thistle is an herb that is traditionally used to support liver function. It may be used to help treat liver problems in cattle, such as liver damage from toxins or medications.

#### 4 CONCLUSIONS & DISCUSSIONS

It is observed that many breeds are typically exists in few regions of India. Most of the breeds can be categorized on North, North-East and West-South zones. It is noted that few animals like goats and sheep from hill sides and non-hill side or plain land side have different set of characteristics, similarly animals like cattle, camel, and buffalo from draught region and non-draught region has some different characteristics. Livelihood affects some health capacity and diseases too. To keep livestock healthy, it's important to provide proper nutrition, clean and hygienic living conditions, and regular veterinary care. Early diagnosis and treatment of health issues can help prevent serious complications and improve the animals' overall health and well-being. Additionally, proper management practices, such as maintaining a clean and dry environment, proper daylight in shed, nutritionally rich and balanced diet, and timely vaccination can help in prevention to the occurrence of various health problems.

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#### ETHICS STATEMENT

This study did not involve human or animal subjects and, therefore, did not require ethical approval.

#### STATEMENT OF CONFLICT OF INTERESTS

The authors declare no conflicts of interest related to this study.

#### LICENSING

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