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Assessment of Risk Factors of Eco-Friendly and Sustainable Beef Fattening in the Northern Part of Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. Author MAJ designed the study, collected data, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors TY, MFI, and BFZ managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The goals of the current study were to evaluate the risk factors involved in livestock production in Bangladesh as well as the current status of the country's cattle farms, the background of farmers conditions, rearing factors, feeding practices, biosecurity conditions, usage of antibiotics and growth promoters, climatic change adjustment, and disease prevalence and treatment strategy. A systematic questionnaire was used to conduct the survey among 300 cattle farms from June 2022 to July 2023. The socioeconomic conditions of farmers, rearing factors, and feeding management of

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the farm's animals are moderately satisfied. Findings from this study indicated that about 28% of farmers were illiterate. Due to inadequate biosecurity present on the farms, the highly alarming fact that 84% of farms had LSD problems, 13% had FMD problems, and the rest had problems with other diseases. When flocks got affected by contagious and virus diseases, it was concerning that only 22% of farms isolated the diseased animals. According to this survey, just about 11% of farm owners were aware of the long-term effects of antibiotic use. Only about 24% of people knew of the health hazards connected to steroid use. Compared to 5% of farm owners who are knowledgeable about microbial resistance, 93% of farm owners are ignorant about it. The use of steroids as a growth enhancer revealed an inversely significant link with the training and treatment of farm animals ($p < 0.01$). The correlation between educational level and the overall biosecurity measure was inversely significant ($p < 0.01$). It was found that 63% of farms use steroids as growth enhancers for raising beef cattle due to the early profit. Dexamethasone injections and other steroid-group tablet formulations are used to artificially fatten cattle. The government and proper authority in the livestock industry could take action to tackle the current issues. Farms should be adaptable to climate change-related adjustments and scientific approaches to cattle farming practices.

Keywords: Livestock; steroids; disease; biosecurity; microbial resistance.

1. INTRODUCTION

One of the most significant agricultural sub-sectors in Bangladesh is livestock, which is crucial to advancing the nation's economy [1]. Livestock is essential to agriculture and helps boost Bangladesh's economy [2]. In this country, between 80 and 85 percent of households raise livestock in rural areas, yet these households are in poor socioeconomic conditions [3]. Rural farmers rarely employ the scientific method of beef fattening [4]. According to the DLS (department of livestock services BD) for 2020–2021, Bangladesh now has 245 lakh cattle, 15 lakh buffalo, 79 lakh sheep, and 266 lakh goats. According to Maikasuwa et al. [5], bull fattening is a suitable method for reducing poverty and enhancing food security among the populace. Indigenous methods of beef fattening include offering straw(hay) by cutting it, mixing it with green grass, and mixing it with rice polish [6]. According to the research of Saadullah [7], Bangladesh's inability to produce livestock to its full potential is mostly hampered by the acute feed and fodder shortage. In Bangladesh, very little fodder is produced each year compared to what is needed [7]. Farmers faced a number of challenges in Bangladesh when trying to sell their fattened cattle. Farmers promote their animals by employing multiple outlets. According to Kohls and Uhl [8], marketing channel refers to the many paths a product can take to reach a customer. To improve the sustainability of the beef production system at the farmer level, it is now required to identify its constraints. Cattle fattening contributes significantly to the following goals: (a) Increasing food production; (b) Improving food security; (c) Eliminating the poverty line; (d) Providing opportunities for youth; (e) Reducing the unemployment issue; (f) Providing draught power; and (g) Using manure as a source of biogas. In addition to selling milk and dairy producers now also fatten beef, particularly before the Muslim holiday of Eid-Ul-Adha. For the enormous population in our nation to meet their demand for protein, beef fattening has a bright future. Because of this, beef fattening is crucial in our nation to meet the need for animal protein. It was believed that Bangladeshi people were utilizing stimulants like steroids and feed additives Islam et al. [9]. A widely used method, more than 50% of farmers in the whole country utilize cattle-fattening drugs, according to Islam et al. [9]. To artificially fatten cow muscle, dexamethasone injections are employed, and other steroid forms are used to feed the cattle. When given dexamethasone injections or steroid pills, cows behave quite calmly. The medicine gradually alters the natural circulation of urine in an animal when 20 to 25 tablets are administered, causing excessive pressure on the kidney and other organs and making the cattle appear overweight after a few days. Even after the medicine has been delivered, the quick way of fattening cattle may result in the animal's death 20–25 days later. The natural fattening technique is a scientific method for fattening cattle that involves feeding the animals the correct ratio of urea, molasses, and straw every day for around six months. The use of dangerous substances like steroids growth hormones, and antibiotics in animal feed is prohibited by the Animal Feed Act of [10]. If this legislation is broken, the offender faces a year in jail, a fine of up to Tk 50,000, or both. Hormone use is prohibited worldwide because their residue

effect is highly harmful for health [11,12]. Numerous epidemiological studies have examined the connection between hormone residues in food and cancer [13-17]. Research is needed to find environmentally friendly and more profitable beef fattening methods for Bangladesh.

1.1 Research Objective

I. To evaluate risk factors and safe beef without the use of drugs in the beef-fattening northern region of Bangladesh.
II. To investigate the present situation & limitation of fattening beef production in the northern region of Bangladesh.

2. METERIALS AND METHODS

2.1 Study Area

The investigation was conducted over the course of a year. The information was gathered through conducting interviews with farmers in three districts in Bangladesh—Pabna, Dinajpur, and Rangpur—due to the large number of cattle in those regions.

2.2 Data Collection

Based on farm-level epidemiological data collected through face-to-face interviews and the observational compilation of a standard questionnaire, the survey was completed. Face-to-face interviews were used to get data from respondents. Interviews were generally conducted in the respondents' homes and fields during their free time. Key informant interviews (KII) were conducted with government livestock authorities, feed distributors, medicine shops, quacks, and others. A total of 300 farm data points were collected. A total of 300 households farms were interviewed taking 100 households from each Dinajpur, Rangpur and Pabna districts. The respondents were chosen from those who raise cattle or who purchase animals for fattening or rearing. Each upazila had a randomly selected respondent who is involved in cattle fattening.

Fig. 1. Bangladesh map (Red color Research Area)

2.3 Parameters Studies

The interview schedule contained Socio-economic status of the farmers, factors affecting the rearing of cattle, feeding Management, disease prevalence & treatment strategy, Impact of using antibiotic & growth promoters on animal or public health, correlation between the use of steroids(growth promoter) and other variables, present status of growth promoter (steroid) and antibiotic uses, condition of biosecurity in farms, correlation between the Education level and biosecurity variables, problems / constrains of beef fattening, main risks that climate change and extreme weather, climate change-related adjustments to cow farming practices and possible remedies of beef fattening during rearing and marketing.

2.4 Statistical Analysis Data

Through the use of SPSS Statistics 25.0, descriptive analysis was carried out, including averages, percentages, and the spearman correlation coefficient (rs) and degree of significance.

The following formula was used to calculate the Spearman correlation coefficient:

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}.$$

Where,

- $d_i = \mathrm{rg}(X_i) - \mathrm{rg}(Y_i),$, is the difference between the two ranks of each observation.
- *n* is the number of observations

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Background of the Farmer

Table 1 displays the socioeconomic standing, which includes Family Type, Education level, Main occupation, age, sex, monthly income, Sources of money, Training on cattle fattening and prior beef fattening experience. Table 1 revealed that the majority (74% contain a nuclear family) and 26% have a joint family. About 28%(both male & female total) of farmers were illiterate, according to the study. The majority of respondents (53%) stated that agriculture was their main occupation. Previous fattening experience of the farmers: more than 50%.

Approximately 45 percent of farmers use their own resources to fund their cattle fattening operations; 25% borrow from NGOs; 20% borrow from banks; and 10% borrow from mohajon. Only 35%(both male &female total) of respondents reported having received training in cattle fattening, which is in line with past findings [9,6] , while 65% of farmers reported having received no training in cattle raising. According to Hossen et al. [3], Sharma et al*.* [1], and Rahman et al. [6], more people with higher education (graduates) are being drawn to the cattle business than they were in the past. The findings of this study ran counter to those of Begum et al*.* [18], who found that 86.7% of farmers used their own money due to city-area rich people . According to the aforementioned remarks, banks, NGOs, and other financial institutions are increasingly lending to farmers on a larger scale. There were reports on related investigations from several authors [6]. There were 28% women attracted to the livestock rearing. Many farmers wanted to rear beef cattle—about 43% of previous fattening was less than 2 years experienced. Overall income is increasing for the farmer from rearing beef cattle.

3.2 Factors Affecting the Rearing of Cattle

As indicated in Table 2, farmers in this survey selected 11% native, 39% crossbreeds, 25% Sahiwal, 8% Red Sindhi, and 14% both native and crossbreed for their fields. About 60% of farmers used both native and cross cattle for fattening, with native cattle making up 28% and crosses up to 12%, which is more or less the same as Rahman et al. [6] . According to Saadullah M [19]; Hossain et al. [20], only 12% of cattle were indigenous, while 88% were cross bred. Table 2 shows that 83% of farmers use fans, whereas only 15% use natural ventilation. The remaining 2% have inadequate ventilation.. Cemented floors make up 82% of all floors, followed by brick floors at 17% and the other varieties. Tin-shaded homes make up 89% of the housing stock, followed by brick homes (6%), and then various other forms. 89% of the area was drained by a system of cannels, 7% by soil-made drainage, and the remaining area had no drainage system. In this study, the number of cattle for fattening was 2–5 (about 46%), 6–9 (about 19%), and the rest of the more number of

cattle reared. According to the findings (Table 2), dairy and beef cattle were preferred by the remaining 48% of farmers for fattening purposes. This study's findings differed from those of Saadullah, [19]; Islam et al. [9], who found that the majority (92%) of farmers chose beef-type cattle for fattening purposes. We conducted a survey of all different types of farmers, but only the large-scale farmers raised beef cattle solely for beef fattening. According to the pattern of cattle fattening found in the current study, 73% of farmers performed fattening solely before Eid-ul-Azha, 21% did so throughout the year, and the remaining farmers engaged in seasonal fattening (Table 2). As reported by Islam et al. [9], the majority of respondents (73%) begin gaining weight before Eid-ul-Azha due to the high demand for cattle, while the remainder continue to practice beef fattening throughout the year.

The fattening period was the most significant component because it calculated the respondents' profit margin. The majority of farmers (42%) fattened their cattle for a period of three to six months; 15% did so for a period of six to one year; and the remaining farmers (34%) fattened their cattle for a period of more than one year (Table 2). According to Islam et al. [9], 79.1% of respondents believed that cattle needed between three and six months to get fat. According to Rahman et al. [6], the majority of respondents (44.7%) fattened cattle for 3 months, while the remainder did it for 6 months or a year. Due to the public's preference for male beef cattle over female calves, sex is a key factor in fattening. The majority (73%) of them chose uncastrated males, whereas the remaining castrated men were fattened (Table 2). Beginning cattle fattening age differed from

Table 1. Socio-economic background of the farmers

Parameters	Categories	% of farmers
Family Type	Nuclear	74
	Joint	26
Education level	Illiterate/No Education	28
	Primary	37
	SSC	14
	HSC	9
	Hons & Higher	12
Main occupation	Job	3
	Farmer	53
	Housewife	21
	Agriculture related business	23
Age	Below 30Year	13
	30-50 Year	47
	50 -70 Year	29
	Over 70 Year	11
Quarterly income (BD TK)	20000-30000	21
	31000-40000	19
	41000-50000	38
	>50000	11
Sources of money	Own	45
	Bank loan	20
	NGO loan	25
	From Mohajon	10
	Others	
Training on cattle fattening	Have	35
	Have not	65
Sex of Farmers	Male	72
	Female	28
Previous fattening experience	0-2 Y	43
	3-5 Y	14
	6-10 Y	17
	>10 Y	26

Table 2. Factors associated with cattle rearing

Parameters	Categories	% of farmers
Breed	Holstein Friesian Cross	39
	Sahiwal	25
	Red Sindhi	8
	Local breed	11
	Both local & crossbreeds	14
No. of cattle for fattening	Others	3
	2-5	46
	6-9	19
	10-15	21
	>16	14
Housing Pattern	Tin shed	89
	Bricks	6
	Made from straw bamboo	2
	Soil made	3
Drainage System	Cannel	89
	Soil made drainage	7
	No sewerage option	4
Floor	Cemented	82
	Bricks	17
	Soil made floor	1
Ventilation	Use fan	83
	Close	2
	Natural	15
Pattern of the program	Eid-Ul-Adha / Fitre	73
	Year Round	21
	Seasonal	6
Fattening period	3 months or less	34
	3-6 months	42
	6 months-1 year	15
	>1 year	9
Sex of Animal	Castrated male	27
	Uncastrated male	73
Condition of fattening animal	Bull	55
	Bullock	25
	Sterile heifer	20
Farm type	Beef type	48
	Dairy type	7
	Beef + Dairy	45

farmer to farmer. According to Islam et al. [9]; Saddullah M. [7], the majority (80.7%) of them chose uncastrated males, while the remaining castrated males were fattened.

3.3 Feeding Management

According to the findings (Table 3), there was ready or packaged feed (balance diet which commercially produced& available in the market) given to 69% of farmers, and the rest weren't given ready feed. Only 27% used the Ration formulation (balance diet made by farmers), and a large percentage, about 73%, did not. The presented data (Table 3) indicate that 87% of farmers provided both roughage and concentrate, while just 11% provided exclusively concentrate. They did not employ any total mixed rations (TMR), which differed from Buza and Holden's [21] statements that 97.6% of survey participants in Pennsylvania were fed a TMR. About 77% of farmers received vitamin and mineral supplements, whereas 23% received none at all. Table 3: Results are shown. 24% of farmers did not cultivate grass, whereas 76% did so as a source of roughage. Saadullah M [7]; Hossain et al. [20] reported that most of the farmers (83%) used cultivated fodder and only

17% farmers used cultivated fodder and roadside grass during rainy season. In this study, only 11% uses farmers used urea molasses straw and 89% did not. 85% of the farmers did not graze the animals, and 15% in different places did. There were about 77% uses for tube wells, 19% for Shallow tube wells, and 4% for river pond water for cattle rearing. Having piped water supply from tube wells and Shallow tube wells. In this research, farmers can keep their animals intensively in 42% of cases, semi-intensively in 51%, or substantially in 7% of cases.

3.4 Disease Prevalence and Treatment Strategy

Table 4 shows that, only 55% of farmers in this survey conducted routine veterinary examinations of their animals, whereas 45% did not. 77% of farm animals were parasite-free, while the remainder were not . Table 4 shows that, compared to the other farm animals, 89% of them had regular practice deworming. In this investigation's findings, 59% of farm animals received regular vaccination, but it is alarming that 41% did not vaccinate. It was dangerous that 84% of farms had LSD (lumpy skin disease) challenges, 13% had FMD (foot and mouth disease) complications, and the other farms had issues with various diseases(black quarter, metabolic disease , anthrax, skin disease etc.) .It was alarming that only 22% of farms isolated the infected animal when flocks were affected by contagious and viral diseases, but a large number of farms did not isolate . In Table 4, it is stated that 63% of farms handled quacks while only 15% of farms received care from veterinarians Hurst et al. [22]; Alam et al. [23] reported agreeing on the same conditions.

3.5 Impact of Using Antibiotic and Growth Promoters on Animal or Public Health

Table 5 shows that approximately 63% of farmers used growth promoters, while the remaining farmers did not. About 87% of farmers said that growth promoters (steroids) increased growth rates, and the rest disagreed. 7% of farmers are aware of the Animal Feed Policy Act, and the remaining 93% are unaware of it. 93% of farm owners don't know anything about microbial resistance, compared to 5% who do.

Table 3. Feeding management

Parameters	Categories	% of farmers
Ready /Packaged Feed	Yes	69
	No	31
Vitamin Minerals	Yes	**77**
	No	23
Urea molasses straw	Yes	11
	No	89
Graze the Animal	Beside main road	6
	Private land	5
	Share land	4
	Zero Grazing	85
Ration formulation	Yes	27
	No	73
Type of feed given	Roughage	2
	Concentrate	11
	Both roughage and concentrate	87
Grass Cultivation	Yes	76
	No	24
Water Supply	Tube well	77
	Shallow tube well	19
	Pond/River	4
Rearing pattern	Intensive	42
	Semi-intensive	51
	Extensive	7

Table 4. Disease prevalence and treatment strategy

Parameters	Categories	% of farmers
Regular Vet Check up	Yes	55
	No	45
Free from parasites	Yes	77
	No	23
Regular Practice deworming	Yes	89
	No	11
Regular Vaccinate	Yes	59
	No	41
Isolate the infected animal	Yes	22
	No	78
Outbreak of Disease	LSD	83
	FMD	13
	Others	4
Treated Farm animal	Own	10
	Quack	63
	LSP	12
	Vet doctor	15

Table 5. Impact of using antibiotic and growth promoters on animal or public health

Parameters	Categories	% of farmers
Used growth Promoters(steroid)	Yes	63
	No	37
Impact of Growth promoters (Steroid)of growth rate	Yes	87
	No	13
Animal feed policy act known	Yes	7
	No	93
Knowledge of Microbial Resistance	Yes	5
	No	95
Knowledge of Effects for Long term use of antibiotic	Yes	11
	No	89
Knowledge about health hazard effect of steroid	Yes	24
	No	76
Animal welfare Acts Knowledge	Yes	6
	No	94

In this study, approximately 11% of farm owners were aware of the long-term effects of antibiotic use, while the remainder were un-aware. About 24% were aware of the health risks associated with steroid use, but the rest were unaware. Only 6% of farmers were aware of the Animal Welfare Act, while 94% were unaware. According to 87% of farmers (Table 5), steroids had a favorable effect on growth or productivity. In the study by [11,12], usage of steroid implants improved average daily growth by 15 to 25% and feed efficiency by 10 to 15% in an intensive beef cattle production system; however, decreased marbling was seen due to extended use of steroid implants. As reported by Platter et al. [24], the use of growth implants raised the average daily gain of steers by 11.8 to 20.5% ($P < 0.05$). As stated by Haque and Sarker [2], several steroids were widely utilized in Bangladesh for cattle and poultry. According to the research of Asem-Hiablie et al. [25], on average, 30% of ranches in the United States' southwest and northwest employed growth implants to produce beef cattle. According to Kamal et al. [26], Hurst et al., [22]; Alam et al. [23], more or less the same results were obtained for the Parameters of the Impact of Using Antibiotics and Growth Promoters on Animal or Public Health.

3.6 Correlation between the use of Steroids (Growth Promoter) and Other Variables

The findings in Table 6 reveal that a variety of factors, including sex, occupation, quarterly income, source of funding, farm type, breed type,

number of fattened cattle, fattening period, training, health risks associated with steroid use, knowledge of microbial resistance, treated farm animal etc. were taken into consideration when determining whether or not to use steroids in small-scale cattle rearing. Table 6 shows a significant ($p<0.01$) relationship between steroid use and various sex, occupation, education level, annual income, breed of cattle, farmer training, and understanding of steroid health risks.

Table 6. Correlation between the use of steroids (growth promoter) and other variables

Parameter	Categories	Spearman correlation coefficient (r_s)	Level of sig.
Main occupation	Farmer Housewife Agriculture related job	-.777	0.01(**)
Sex	Male Female	-.816	0.01(**)
Education	Illiterate Primary SSC HSC Hons and over	-.765	0.01(**)
Source of money	Own Bank loan NGO loan From Mohajon others	-.875	0.01(**)
Quarterly income	20-30K 31-40K 41-50K >50K	-.744	0.01(**)
Farm type	Beef Dairy Both	-.787	0.01(**)
Breed of cattle	HF cross Sahiwal Red Sindhi Local breed Others	.585	0.01(**)
Pattern of program	Eid-ul-adha/fitre Year round Seasonal	-.493	0.01(**)
Fattening period	3month or below 3-6 months 6month-1 year >1year	-.746	0.01(**)
Training	Have Have not	-.574	0.01(**)
Health hazard of steroid	Yes No	.440	0.01(**)
Knowledge of Microbial Resistance	Yes No	.180	0.74(NS)
Treated Farm animal	Own Quack LSP Vet doctor	-.739	0.01(**)

*r_s,=Spearman correlation coefficient; NS, Non-significant ($p>0.05$); *= $p<0.05$, **= $p<0.01$*

The r_s value of breed of cattle , health hazards of steroids and knowledge of microbial resistance was positively correlated with steroid practice and breed of cattle & health hazards of steroids had a significant (p <0.01) positive relationship with steroid use. But knowledge of microbial resistance has no significant relationship with steroid use. The r_s value of sex, occupation, education, quarterly income, fattening period, farm type, pattern of program, fattening period, The treated farm animal was negatively correlated with steroid practice but had a significant (p <0.01) .Here, we can state that those who are underprivileged and illiterate are more inclined to utilize various steroids in unlawful ways to increase their earnings. The r_s value of Treated Farm animal was -.739, it indicates the use of steroids was increased with the decreased vet treated which was significant (p<0.01).The rs value of training was -.574, which is significant (p< 0.01) and shows that the usage of steroids increased as farmer training dropped .Once more, the rs value of education is -.765, which shows that there was a substantial (p< 0.01) correlation between the use of steroids and education level.

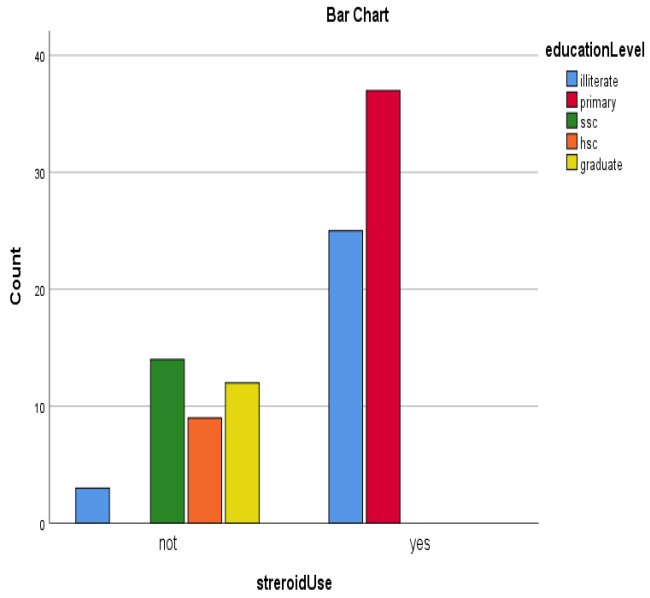

Fig. 2 Relation with Steroid use and educational level(pearson chi -square)

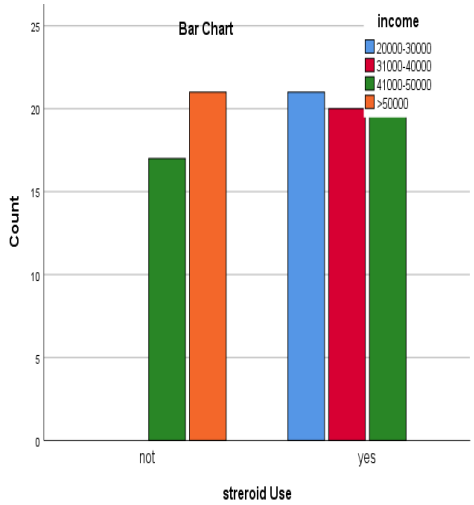

Fig. 3. Relation with Steroid use and Income (pearson chi -square)

3.7 Present Status of Growth Promoter (Steroid) and Antibiotic Uses

Regarding the respondents, 63% of farmers used steroids as growth promoters, whereas the remaining respondents did not use any growth promoters during the period of fattening (Table 7). In the study conducted by Islam et al. [9], 70.6% of the respondents used anabolic steroids to promote growth, while the remaining respondents used no growth-promoting substances at all. As reported by Rahman et al. [6], 34.7% of farmers utilized beef-fattening medicine. In an effort to artificially fatten cow muscle, dexamethasone injections are used, and other steroid group tablet forms are fed. Most commonly used steroids are Gludex (tablet), Dexamethasone for human) , Pednivet (Steroid tablet) ,Dexaphos plus(injection cocorticoid steroid), steron vet(bolus),vetodex (bolus), remedex (injection), Pednivet (Steroid), Oradexon (Glucocorticoid steroid), Decason (Glucocorticoid steroid) , dexason vet (bolus), Tredexanol (Synthetic steroid) Paractin (for human medication but used for fattening) etc.Steroid medicine contraindications include aspirin, cyclosporine, diabetes medication, diuretics, ketoconazole, phenobarbital, phenytoin, rifampin, and warfarin medicines [13,14,15,16 and 17].The rise of multidrug-resistant (MDR) bacteria is threatening the clinical efficacy of several current medicines., the recent appearance of strains with reduced susceptibility, and the undesirable side effects of certain antibiotics. Infectious diseases caused by resistant microorganisms are associated with prolonged hospitalizations, increased cost, and a greater risk of morbidity and mortality [27]. The long-term use of antibiotics is very alarming for health conditions. There must be a withholding period until the residues are minimal or no longer detectable. To protect humans from antibiotic-added food, a withdrawal time must be set. They discovered a significant tissue content of many broad-spectrum antibiotics in marketed animals [28]. This situation raises concerns because our farmers are unaware of the withdrawal time, do not bother to keep drug consumption at an appropriate level, and do not follow qualified veterinarians' prescriptions. Fig. 4 shows the withdrawal period of antibiotics and steroids. Table 7 shows that the agent who uses steroids influences the farmers. Table 8 summarizes the current state of antibiotic use. Antibiotics use information taken from veterinary medicine shops, LSPs, quacks, vets, feed dealers, etc.

3.8 Condition of Biosecurity in Farms

Fig. 5 shows the actual condition of Biosecurity in farms.

Table 7. Agent who uses steroids influences the farmers

Steroid uses Influencer	Uses %
Livestock Practitioner/ Quacks	33%
Feed dealers	11%
Medicine shop/pharmacy	12%
Medical Representative	2%
Neighbor	4%
Veterinarian	1%
Total	63%

Table 8. Current state of antibiotic use

Antibiotic name	Uses %
Penicillin	32%
Gentamicin	38%
Oxytetracycline	7%
Azithromycin	5%
Cephalosporin	7%
Ciprofloxacin	5%
Others	6%
Total	100%

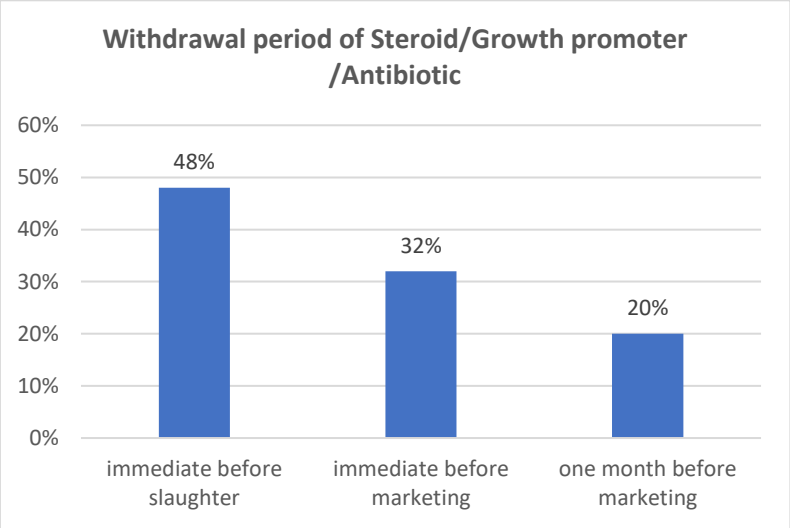

Fig. 4. Withdrawal period of steroid/antibiotic. (there is a specific withdrawal period contain when used antibiotic/steroid medicine)

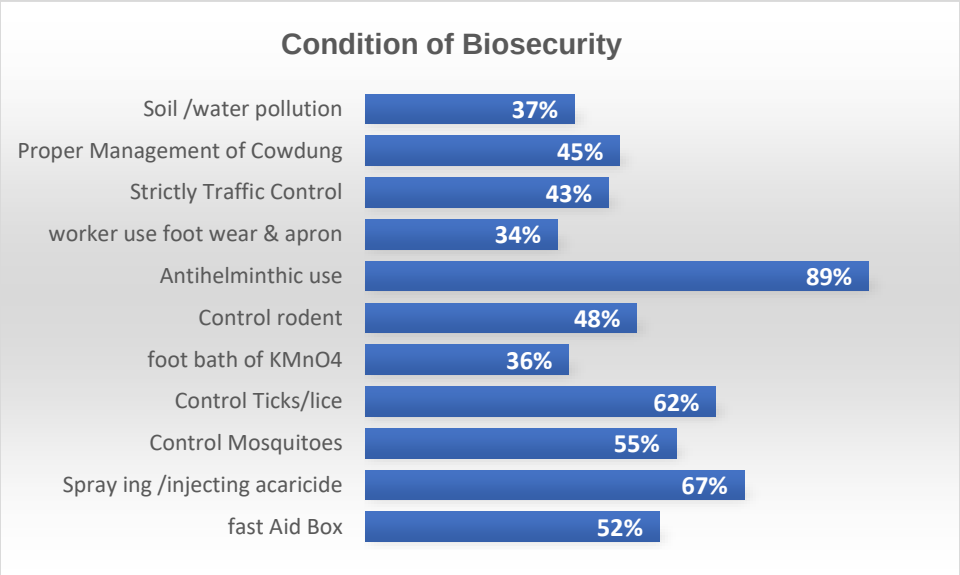

Fig. 5. Present condition of biosecurity

The r_s value of all biosecurity variables was negative, which indicates the negative effect of biosecurity decreased with the increased farmer education level, which was significant ($p < 0.01$). If improving the biosecurity of farms requires proper education and training of farmers, Alam et al. [23] and Hurst et al. [22] both suggest developing the biosecurity of rural farms.

3.9 Problems / Constrains of Beef Fattening

Less price of animals, More than demand; Capital Problems; Increase feed cost; Emerging Infectious Diseases (Lumpy skin disease, FMD etc); Unorganized cattle markets; Importation of animals from other countries, Rainfall measure: high or low; Period of great heat Larger; Unjust pricing by Broker; Government and non-governmental organizations give fewer subsidies in the livestock sector. High accommodation costs; Improper vaccination; Inadequate pasture land; Lack of Fodder production; Import of large amounts of animal feed; Lack of effective treatment; Ignore animal welfare acts and the Animal Feed Policy Act; No system exists for grading animals; Increased cost of transportation.

Table 9. Correlation between the Education level and biosecurity variables

Parameter	Categories	Spearman correlation coefficient (r_s)	Level of sig.
Fast Aid Box	Yes No	-.657	0.01 **
Spraying/injecting acaricide	Yes No	-.744	0.01**
Control Mosquitoes	Yes No	-.669	0.01**
Control Tick/Lice	Yes No	-.706	0.01**
Foot bath of KMnO4	Yes No	-.636	0.01**
Control rodent/mice	Yes No	-.646	0.01**
Anti Helminthic use	Yes No	-.519	0.01**
Worker use foot wear & apron	Yes No	-.638	0.01**
Strictly Traffic Control	Yes No	-.637	0.01**
Proper Management of Cow dung	Yes No	-.640	0.01**
Soil/ water/ Air pollution	Yes No	-.635	0.01**

*r_s=Spearman correlation coefficient; NS, Non-significant (p>0.05); *= p<0.05, **= p<0.01*

3.10 The Main Risks that Climate Change and Extreme Weather Occurrences Present to the Business Sector

Modifications in the growth of grass and fodder; The onset of heat stroke in animals; Animal health changes brought on by parasites, infectious illnesses, and mastitis. Problems with animal reproduction (lower animal estrous and conception rates). The diminished supply and potential price increase of animal feed. Less milk volume during prolonged droughts and hot summer days. Government initiatives to lower agricultural GHG emissions. There is less dialogue about climate issues between environmental specialty groups and cattle farmers.

3.11 Climate Change-Related Adjustments to Cow Farming Practices

Modifying feeding procedures; Altering the makeup of diets; Altering the timing and/or frequency of feedings. Cattle become more immune to illnesses and heat stress. Altering the timing of seasonal breeding to regulate cattle reproduction. Cattle relocation: Growth patterns and development.

3.12 Possible Remedies of Beef Fattening

Appropriate guidance of farmers in animal farming. Strictly market monitoring. Proper vaccination Schedule maintain and mass vaccination. Government and non-governmental organizations give more subsidies in the livestock sector. The government and non-governmental organizations should give low-interest loans to farmers. Proper utilization of land and cultivating fodder. Development of a balanced diet to minimize costs. Quack treatment is totally prohibited; only licensed veterinarians are allowed to treat animals. Improving market infrastructure & reduce the cost of transportation. Regulation of market prices by the government. Price changes should be monitored.

4. CONCLUSION

The information was gather using pre-tested questionnaire to acquire information through direct interview of the farmer from the northern part of Bangladesh. The information was collected from 300 farms including the information about the methods using for beef fattening, their limitations and the problems cope up procedures by the farmer. In recent years beef fattening systems have grown in popularity,

due to their profitability, quick turn around time, and low startup capital needs. Farmers raise beef cattle for fattening in the majority of Bangladeshi villages without any scientific understanding. It is worrying that 28% of farmers were illiterate, 63% of farms use steroids, regular checkup vets (55%), and regular vaccinations (59%) as cattle fattening. According to the Bangladesh Animal Feed Act of [10], certain medicines and steroids are prohibited from being used for fattening. About 35% farmers have training for beef fattening. This research found that when flocks are infected with infectious and viral infections, it is concerning that only 22% of farms separate the infected animals. The usage of steroids as a growth promoter indicated an adversely significant relationship with farm animal training and treatment ($p < 0.01$). The relationship between educational level and overall biosecurity was shown to be inversely significant ($p < 0.01$). Overall, biosecurity is moderately satisfied. Farmers do not receive adequate training in the management and production methods used in beef cattle fattening. Increasing the infrastructure of cattle houses and reducing environmental pollution are necessary steps for proper authority. Farm owner awareness should be established about the impact of using antibiotics and growth promoter on animal or public health**.** Strict guideline disease control strategy, maintain biosecurity, seasonal credit support, information on fattening technology and suitable breed for improving beef cattle productivity. Small-scale businesses can benefit from government assistance programs and policies. It becomes an excellent option for lowering unemployment and poverty as well as meeting the demand for protein in our nation's population. There is a need for research to identify environmentally sustainable and economic beef fattening techniques for Bangladesh.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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