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# Current scenario on reproductive management and performances of dairy cows in Manikganj district

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ABSTRACT

The aim of the study was to evaluate reproductive management and performance of dairy cows in Manikganj district. A total of 400 cows with varying genetics, including native (N), Sahiwal or Red Sindhi cross with native cows (S or RS×N), and Holstein-Friesian cross (HFC), were randomly selected from 60 farms, between February to November 2022. Various practices linked to reproductive management and parameters associated with reproductive performance, such as calving to first service interval (CFSI), calving to conception interval (CCI), number of services per conception (NSC), and calving interval (CI), along with data on health problems related issues, were collected using a predetermined questionnaire by interviewing farmers and personal observations. Results reveal that visual observation method (100%) was used for estrus detection and 91.67% farmers observed their cows several times in a day. The majority of farmers (78.3%) followed artificial insemination (AI) to conceive their cows. Only 43.3% farmers checked cow's pregnancy routinely at 90-120 days after breeding by rectal palpation. Additionally, 26.7% farmers maintained dry period of their milch cows, whereas, 73.3% were not interested. Most of the farmers (75.0%) provided vitamin-mineral supplements during gestation period. However, only 30.0% farmers maintained hygienic condition during puerperium period. The average reproductive performances were CFSI (111.9 ± 18.0, 110.8 ± 21.9 and 106.4 ± 22.1 days), CCI (124.8 ± 20.0, 125.9 ± 21.8 and 121.7 ± 21.3 days), NSC (1.6 ± 0.5, 1.7 ± 0.6 and 1.8 ± 0.6) and CI (409.4 ± 21.4, 412.4 ± 21.8 and 408.3 ± 21.0 days) in N, S or RS×N and HFC cows, respectively ($p>0.05$). The overall prevalence of reproductive problems was 29.5 % and this rate was 46.0, 33.3 and 27.1% in N, S or RS×N and HFC cows, respectively. Therefore, reproductive management practices were good in majority of farms, but need to improve and performance of cows managed, is acceptable and mostly fall within the reproductive goals for sustainable production and farm income.

## Introduction

Livestock, especially dairy cows play a very important role in the national economy of Bangladesh. The majority of the rural people of Bangladesh rely on dairy animals for their livelihood to some extent, which clearly indicates the poverty reduction potential of this sub-sector (Uddin *et al.,* 2014). Hence, the economic and social importance of dairy cows is very noteworthy in the country.

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The total annual milk production of Bangladesh is 11.9 million ton (DLS, 2021), which is lower than the demand (15.4 million ton) of the country. It is expected that Bangladesh will be self-sufficient in milk production (17.1 million ton) by 2030 according to the Department of Livestock Service (DLS), Bangladesh (DLS, 2021). Therefore, to meet the growing demand and ensure the food security and safety, the productivity of dairy cows should be increased many folds. The adoption of appropriate reproductive management program for dairy cows is a way to increase the reproductive efficiency, their productivity as well as farm income that imply sustainable dairying (Crowe *et al*., 2018).

The productivity of dairy cows mostly depends on their reproductive performance or efficiencies (Hossein-Zadeh, 2013). The reproductive efficiency refers to the proportion of cows eligible to be bred that become pregnant during an estrous cycle (or approximately 21 days), which determines the calving to conception interval at the end of the voluntary waiting period (Consentini *et al.,* 2021). It is widely accepted that the reproductive efficiency of cows is one of the major factors affecting production and thereby profitability of the dairy farms. The reproductive efficiency of breeding cows is determined by several indicators including age at first service (AFS), age at first calving (AFC), calving to first service interval (CFSI), calving to conception interval (CCI) or days open (DO), calving interval (CI) and number of services per conception (NSC) etc. (Crowe *et al*., 2018; Shiferaw *et al*., 2003). While the success of dairy farming heavily relies on the reproductive efficiency of cows, reproductive inefficiency resulted in inconsiderable economic losses of the dairy farms due to prolonged calving interval, early culling of potentially used cows, reduced milk yield and overall production lifetime, and increased costs due to veterinary service (Lobago *et al*., 2007; Sarder *et al.,* 2010). The major reproductive problems, which have a direct impact on the reproductive performance of dairy cows include repeat breeding syndrome (RBS), anestrus, abortion, stillbirths, dystocia, uterine and vaginal prolapse, puerperal metritis, etc. (Arero, 2022; Khair *et al*., 2013; Svensson *et al*., 2019). Such reproductive diseases and disorders lead to prolonged calving intervals and lower conception rate in cows in Bangladesh (Shamsuddin *et al*., 2001; Sarder *et al*., 2010). Therefore, reproductive diseases and disorders of cows might cause significant economic losses to the dairy farms in Bangladesh (Talukder *et al*., 2005). To improve the reproductive performance of cows, accurate diagnosis, proper treatment management and appropriate prevention strategies of the reproductive diseases and disorders are highly essential. Thus, appropriate reproductive health management is crucial for successful pregnancy and optimum lactation of cows as well as economic return from dairy farms (Medeiros *et a*l., 2022; Sima *et al*., 2023).

The people of Bangladesh are rearing three categories of cattle like pure breed, crossbreed and native or local-breed (Azizunnesa *et al*., 2009). In rural areas of Bangladesh, most of the farmers follow traditional production and farm management especially in the feed management, disease management, adoption of AI, etc. (Datta *et al*., 2019). A large number of dairy cows remain barren or unproductive round the year, having exposed many times for natural services (NS) or artificial insemination (AI) and become a burden for the farmers. These might be due to inadequate reproductive management, and hence, the reproductive performance of cows in Bangladesh is not satisfactory (Rahman *et al*., 2009; Sima *et al*., 2023). Since the main aim of the reproductive management program is to reduce the calving interval, increase the conception rate and produce calves at low cost, thus proper application of reproductive management program will help the farmers of the rural areas of this country to achieve the targeted production goal. In the present study, Manikganj district was selected as the study area. The commercial dairy farms have been increasing day by day in Manikganj district. Mostly, low-income group of rural people has taken this farming as profitable enterprise. According to the District Livestock office, Manikganj, milk production is higher than the annual target of this district. The annual target for cow milk production

is 195,000.00 tons and there are 8,559 dairy farms in the district. As such, the daily milk production is 575.34 tons and henceforth, Manikganj district can be considered as a very significant region for dairy production. In order to establish future plan for dairy development in this region, it is essential to find out details about the management practices and performances of different types of dairy breeds. With this view in mind, the investigation was undertaken to explore the reproductive- management practices, performances and health problems of the dairy cows in Manikganj district.

***Development of questionnaire***

A predefined structured questionnaire was developed according to the objectives of the investigation. The questionnaire included information about dairy farms and farmers, reproductive management practices (estrus detection, breeding methods and timing, pregnancy diagnosis, dry cow management, management of cows during parturition and postpartum period, voluntary waiting period, and treatment of reproductive diseases and disorders), and data on health problems related issues of cows


**Fig. 1. Study areas in Manikganj district of Bangladesh.**

## Materials and Methods

***Study areas and period***

The study was carried out in different Upazilas of Manikganj district, which include Saturia, Shibalaya, Singair, Daulatpur, Ghior, Harirampur and Sadar upazila (Fig. 1) during the period from February to November 2022.

such as anestrus, uterine infections (UTI), repeat breeding syndrome (RBS), cystic ovarian diseases (CODs), dystocia, retained placenta (RP), puerperal metritis, uterine prolapse, vaginal prolapse, abortion and premature and still birth. The outline for the investigation in Manikganj District is summarized in Fig. 2.

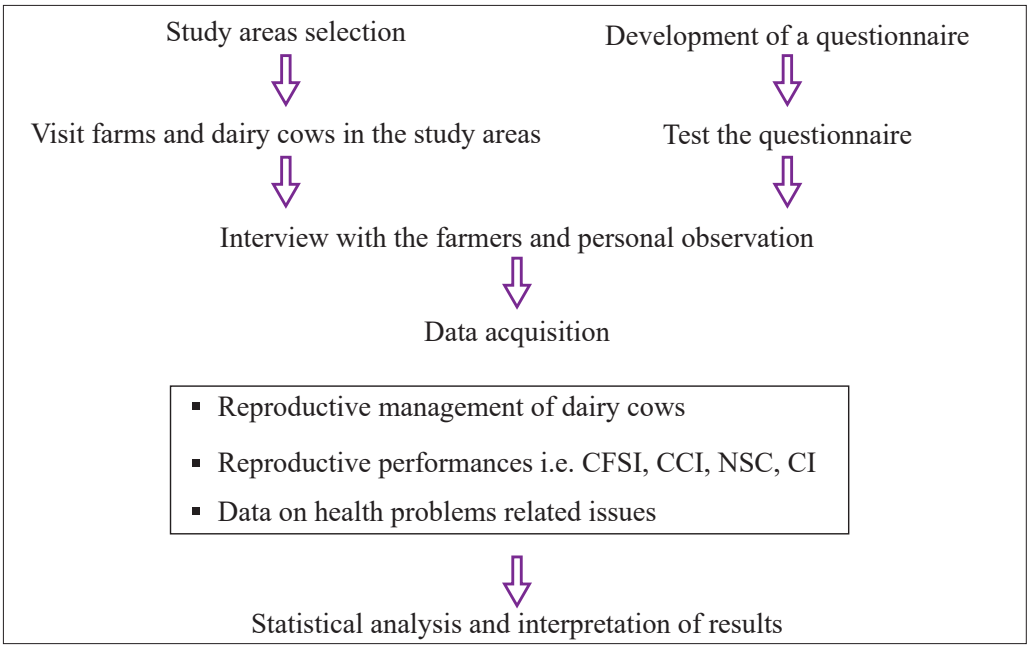


**Fig. 2. Outline for the investigation in Manikganj District of Bangladesh.**

***Data acquisition***

***Dairy farms and cows in the study area***

A total of 60 dairy farms covering 400 dairy cows were randomly selected in the study areas. Among these 60 dairy farms, native (N), Holstein-Frisian cross (HFC) and mixed types [native (N) or Sahiwal (S) or Red Sindhi (RS) cross with native (S or RS×N) and HFC] farms were included.

***Visiting the farms and interviewing with farmers***

Each farm was visited in person and farmers were requested to kindly join the interview for research purpose of the present study (Fig. 2). The data were then collected and recorded from direct interviewing of the farmers and/or from register of the respective farms.

***Reproductive parameters***

The reproductive indices/parameters of dairy cows were considered including calving to first service interval (CFSI), calving to conception interval (CCI), number of services per conception (NSC) and calving interval (CI). CFSI is defined as the number of days between the time, a cow calves and her first service (Dayyani *et al*., 2013).

CFSI = First service after calving - calving date.

CCI is the period (days) between the calving date and the following conception of dairy cows (Dayyani *et al*., 2013).

CCI = Calving date - conception date.

NSC is the average number of services required for conception. It is considered as a measurement of reproductive efficiency in cows. CI is the interval between the dates of one calving to the dates of next calving and was recorded in days (Dayyani *et al*., 2013).

CI = Last calving to conception interval (days) + gestation period (280 ± 10 days)

***Collection of data on reproductive health problems of dairy cows***

Various reproductive health problems related issues of cows such as anestrus, uterine infections (UTI), repeat breeding syndrome (RBS), cystic ovarian diseases (CODs), dystocia, retained placenta (RP), puerperal metritis, uterine prolapse, vaginal prolapse, abortion and premature and still birth were recorded.

At the same time, conditions of floors of the farms or sheds were observed by visual inspection. Hygienic conditions like dry, wet, and soiled with dung, etc. were also observed and recorded properly. The ventilation system was noticed, as it is an important aspect of farm management. Management strategies related issues for reproductive diseases and disorders of cows was interviewed to the farmers and recorded appropriately. Farmers were called to the registered veterinarian (vet), veterinary field assistant (VFA) and/or quack for the treatment and management of reproductive diseases related issues.

***Statistical analysis***

The data were entered into Microsoft Excel Worksheet and then transported to the SPSS software version 14.0 (NY, Chicago, USA) for further analyses. Descriptive statistics were applied for calculation of mean and percentages (%). One-way analysis of variance (ANOVA) was carried out to compare reproductive performances. p -values $< 0.05$ were considered statistically significant difference.

**Results and Discussion**

The study was conducted to explore the reproductive management practices and to evaluate the reproductive performances as well as prevalence of reproductive health problems of dairy cows in the different Upazilas of Manikganj district.

***Types of dairy farms and cows***

A total of 60 farms with 400 dairy cows in seven Upazilas of Manikganj district were visited and the information regarding reproductive management practices, reproductive performances as well as prevalence of reproductive health problems were collected. Among the 60 dairy farms, 4 exclusively housed native cows (N; non-descriptive local zebu cattle), 35 farms had Holstein Friesian cross (HFC) only and 21 farms were consisted of mixed types cows (N, S or RS×N and HFC). The different types of farms and dairy cow related data in the study areas are summarized in Table 1.

***Reproductive management practices followed by the dairy farms***

***Estrus detection***

Estrus detection methods, time spent for estrus detection and use of estrus synchronization in the dairy farms of Manikganj district are summarized in Table 2. The most commonly used method for estrus detection was visual observation of estrus signs (100%; 60/60) irrespective of the types of dairy farms. Dairy farmers did not use any estrus detection aids or video monitoring with a close circuit camera for estrus detection in the study areas. These might be due to unavailability of the advanced reproductive management tools or ignorance of the farmers in the study areas. On the contrary, in the developed countries like Hungary, dairy farmers used estrus detection aid (Fodor *et al*., 2019), where they reported that among the 34 farms, 75% farmers used estrus detector machine and only 25% farmer detected estrus by visual observation.

**Table 1. Number of dairy farms based on breeds of cows surveyed in the study area**

| Farm Types | No. of Dairy Farms | No. of Dairy Cows |
|---|---|---|
| Native (N) cows only | 4 | 13 |
| Holstein-Friesian cross (HFC) only | 35 | 212 |
| Mixed types (N, S or RS×N and HFC) | 21 | 175 |

**Table 2. Estrus management in different types dairy farms in the study area**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Estrus detection methods | Visual observation of estrus signs | 4 | 35 | 21 | 60 (100.0%) |
| | Estrus detection aids | 0 | 0 | 0 | 0 (0.0%) |
| | Video monitoring by close-circuit camera | 0 | 0 | 0 | 0 (0.0%) |
| How many times does farmer observe cows for estrus in a day? | Two times (early morning and evening) in a day | 0 | 5 | 0 | 5 (8.33%) |
| | Several times in a day | 4 | 30 | 21 | 55 (91.67%) |
| How long does the farmer observe cows for estrus each time? | Time (minutes) | 2-5 min | 5 min | 2-5 min | 2-5 min |
| Does the farmer apply hormonal synchronization for estrus induction? | Yes | 0 | 0 | 0 | 0 (0.0%) |
| | No | 4 | 35 | 21 | 60 (100.0%) |

Cows were generally observed for estrus mainly two times in a day, one in the early morning and other in the early evening with 30 minutes each time (Cardoso *et al*., 2021). In the present study, majority of the dairy farmers (55/60; 91.67%) observed their cows for estrus several times (4-5 times) a day for 2-5 min each time regardless of the farm types. On the contrary, only few farmers (5/60; 8.33%) in the study area observed their cows twice a day, early morning and evening, but only for 2-5min. It was reported that several times observation increases the estrus detection efficiency (Perera, 1999). Van Schyndel *et al.* (2019) stated that in Canada, farmers observed estrus in average 2.9 times in a day. In the present study, even though farmers observed several times in a day for estrus detection, however, they did not pay much attention adequate time that ultimately results in AI failure and increased number of services per conception, which needs to be considered by the farmers in the study areas.

Farmers (100%) did not apply any kind of hormonal synchronization program for the onset of estrus in dairy cows might be due to ignorance or unavailability of services in the study areas. Usually, many producers utilize estrus synchronization to tighten up their calving interval (Biswas *et al*., 2017). Ghosh *et al.* (2012) concluded that estrus synchronization followed by fixed time AI could be applied for higher pregnancy rate in zebu and crossbred heifers. Moreover, Biswas *et al*. (2017) stated that almost 70% dairy cows, which were in anestrus, responded to hormonal synchronization in Kurigram district of Bangladesh. Therefore, dairy farmers in the Manikganj district need to adopt this technology for accurate heat detection and increase the reproductive efficiencies of cows.

### *Breeding management*

Breeding methods and timing of breeding used in the farms of study areas are presented in the Table 3. In the current study, seventy-eight (78.3%) percent dairy farmers followed AI and other 21.7% farmers followed combination of AI and natural breeding system to conceive their cows. Similar to these findings, Khan *et al*. (2010) observed in Mymensingh district that 87% cows were serviced by AI and 13% were combined (either AI or natural) breeding. Moreover, Hossain *et al*. (2004) also stated that 93% were inseminated artificially and 7% was combined. Interestingly, no farmer owners of native cows in the study areas used AI as means of breeding technique.

**Table 3. Breeding management in different types of dairy farms**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Methods breeding | Artificial insemination | 0 | 35 | 12 | 47 (78.3%) |
| | Natural service | 0 | 0 | 0 | 0 |
| | Either AI or natural service | 4 | 0 | 9 | 13 (21.7%) |
| Timing of breeding | Hours following detection of estrus | 12-16 | 12-16 | 12-18 | 12-16 |
| Does the farmer keep record for breeding service of cows? | Yes | 4 | 35 | 21 | 60 (100.0%) |
| | No | 0 | 0 | 0 | 0 (0.0%) |
| Does the farmer use breeding and/or gestational calendar for cows? | Yes | 0 | 0 | 0 | 0 |
| | No | 4 | 35 | 21 | 60 (100.0%) |

The actual breeding time is 10-12 hours after heat detection (Berry *et al*., 2014). In the present study, among 60 dairy farms irrespective to the type of farms, all the farmers maintained the time schedule i.e., 12-18 hours after onset of heat for breeding. Breeding record is very essential for every dairy farm to maintain reproductive performance (Herath, 2009). All the dairy farmers (100%) in the study areas kept breeding records. On the other hand, all the farm owners (100%; 60/60) were not aware about the breeding and/ or gestational calendar for cows.

***Pregnancy diagnosis***

Pregnancy diagnosis after insemination is very important for successful parturition (Bekele *et al*., 2016). Pregnancy check and methods of pregnancy diagnosis of dairy cows in different types of farms are presented in Table 4. Among 60 dairy farms, only 26 (43.3%) farmers in the study areas checked their cow's pregnancy routinely. They checked their pregnant cows 90 to 120 days after breeding. On the other hand, 34 farmers (56.7%) did not check their cows for pregnancy. Of note, all the dairy owners reared native cows did not check their cows for pregnancy diagnosis. Van Schyndel *et al.* (2019) stated that the minimum interval after AI for pregnancy diagnosis was <30 days on 15.6% of farms (n= 162), between 30 and 34 days on 48.4% of farms (n= 503), 45 days on 6.1% of farms (n = 63). After pregnancy diagnosis, 68.5% of farms routinely confirmed pregnancies. In the studied area, the most commonly used method was rectal palpation to diagnose pregnancy. Due to unavailability of ultrasound machine facility farmers could not use ultrasonography and other methods to diagnose pregnancy in cows. Luby *et al*. (2020) observed that 52.3% farm used ultrasonography, 37.6% used rectal palpation and 10.1% used others methods for pregnancy diagnosis which was not consistent with the present findings.

**Table 4. Pregnancy diagnosis of dairy cows in different types of farms**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Does the farmer check cow for pregnancy? | Yes | 0 | 15 | 11 | 26 (43.3%) |
| | No | 4 | 20 | 10 | 34 (56.7%) |
| If yes, when does the farmer check cow for pregnancy? | Days after breeding | 0 | 90-120 | 90-120 | 90-120 |

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Methods of pregnancy diagnosis | Rectal palpation | 0 | 15 | 11 | 26 (43.3%) |
| | Ultrasonography | 0 | 0 | 0 | 0 (0.0%) |
| | Others | 0 | 0 | 0 | 0 (0.0%) |

***Dry cow management***

Dry cow management related data in different types of farms in the study areas are presented in the Table 5. Only 26.7% (16/60) dairy farmers in the study areas maintained dry period of their milch cows whereas, the majority (73.3%; 44/60) of the farmers were not interested to maintain this period. Mainly large economic dairy farm owners maintain dry period for better reproductive performance (Beever, 2006). In the study areas, most of the farmers did not maintain dry period due to lack of proper training and/or ignorance about the reproductive management of dairy cows. Among the dairy farmers those who maintained dry period of their milch cows on an average 60-90 days before parturition in the study areas. Rahman *et al*. (2019) stated that the actual dry period for crossbred cows and indigenous cows were 98.5 and 141days, respectively. The majority of the farmers (75.0%, 45/60) provided vitamin-mineral supplements like vitamin D, Calcium and Phosphorus during gestation period because this time was the very crucial moment for dairy cow and production.

**Table 5. Dry cow management in different types of farms**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Does the farmer maintain a dry period for pregnant milch cows? | Yes | 0 | 13 | 3 | 16 (26.7%) |
| | No | 4 | 22 | 18 | 44 (73.3%) |
| If yes, how long does the farmer maintain dry period for cows? | Days before parturition | 0 | 60-90 | 75-90 | 60-90 |
| Does the farmer provide vitamin-mineral (Vitamin D, Ca, and P) supplements during the last month of gestation? | Yes | 0 | 35 | 10 | 45 (75.0%) |
| | No | 4 | 0 | 11 | 15 (25.0%) |

***Management of cows during parturition and postpartum period***

The information regarding management of cows during parturition and postpartum period are summarized in the Table 6. In the present investigation, it was found that only 18 (30.0%) farms owner maintained hygienic condition as well as clean environment and other 42 (75.0%) owners did not maintain during parturition and postpartum period. Most of the farmers in the study areas maintained a consisted BCS (3.0-4.5 of 1-5 scale range) of their cows during pregnancy and parturition. The BCS of a pre-calving cow will influence her post-calving feed needs as well as her rebreeding performance (Dyer, 2009). In native cow farms, most of the cows were in BCS 3.5-4. About farms, the cows had BCS 2.5-3.0, because of poor hygienic environment and lack of balanced ration in study areas. However, in H×F cows and mixed type 58.3% farmers called vet when the milch cows was delayed. They contacted a registered veterinary doctor who checked their cows at any risky situation. Although, farmers (41.7%) did not call vet and they performed this situation by themself because of their experience. Only 38.3% farm owners called a vet if there retained placenta happened, but 61.7% farm owners did not call a vet in such situation. Two types of suckling mainly practiced in our country (Singh *et al*., 2017). During observation, it was found that 26.7% farmers maintain free suckling and most of the farmers (73.3%) maintained restricted suckling. Krohn (2001) reported that free suckling is better than restricted suckling for udder improvement.

**Table 6. Management of cows during parturition and postpartum period**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Does the farmer maintain hygienic condition during parturition of cows? | Yes | 0 | 10 | 8 | 18 (30.0%) |
| | No | 4 | 25 | 13 | 42 (70.0%) |
| What is the BCS of cow, maintained at calving? | 1-5 scale | 2.5-3.0 | 3.5-4.5 | 3.0 -4.0 | 3.0-4.5 |
| Does the farmer call a vet if parturition is delayed/ abnormal? | Yes | 0 | 28 | 7 | 35 (58.3%) |
| | No | 4 | 7 | 14 | 25 (41.7%) |
| Does the farmer call a vet if placenta is not expelled within 12 hours of parturition? | Yes | 0 | 20 | 3 | 23 (38.3%) |
| | No | 4 | 15 | 18 | 37 (61.7%) |
| Which types of suckling does the farmer maintain for the cow? | Free | 4 | 0 | 12 | 16 (26.7%) |
| | Restricted | 0 | 35 | 9 | 44 (73.3%) |

***Voluntary waiting period***

Voluntary waiting period (VWP) for reproductive management of cows is summarized in Table 7. Among the 60 farms, no farmer used VWP for their dairy cattle which is crucial for cow's health.

**Table 7. Voluntary waiting period for reproductive management of cows**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Does the farmer use VWP for parturient cows? | Yes | 0 | 0 | 0 | 0 (0.0%) |
| | No | 4 | 35 | 21 | 60 (100.0%) |
| If yes, how long the farmer maintains the VWP? | Days since parturition | 0 | 0 | 0 | 0 (0.0%) |

In general, a minimal VWP of 45 to 60 days post-partum is recommended, allowing for complete uterine involution and resumption of normal ovarian cyclicity to improve the rate of successful conception after AI (Inchaisri *et al*., 2011).

***Management strategies for reproductive diseases and disorders of cows***

Only few dairy farmers (31.7%; 19/60) in study areas were very conscious about the treatment as reproductive diseases have dangerous effect on farm profitability (Table 8 and Fig. 3). A majority of the dairy farmers (76.7%) did not call veterinary doctor when they diagnosed cow with abnormal vaginal discharge, when a cow failed to come in heat after 3 successive services, in the study areas.

**Table 8. Treatment strategies for reproductive diseases and disorders of cows**

| Practices | Categories | Farm Types | | | |
|---|---|---|---|---|---|
| | | Native (n=4) | HFC (n=35) | Mixed Types (n=21) | Total (n=60) |
| Do cows with abnormal vaginal discharge examined and treated by veterinarian? | Yes | 0 | 15 | 4 | 19 (31.7%) |
| | No | 4 | 20 | 17 | 41 (68.3%) |
| Does the farmer call a vet to examine cows not conceived after 3 consecutive services? | Yes | 0 | 12 | 2 | 14 (23.3%) |
| | No | 4 | 23 | 19 | 46 (76.7%) |

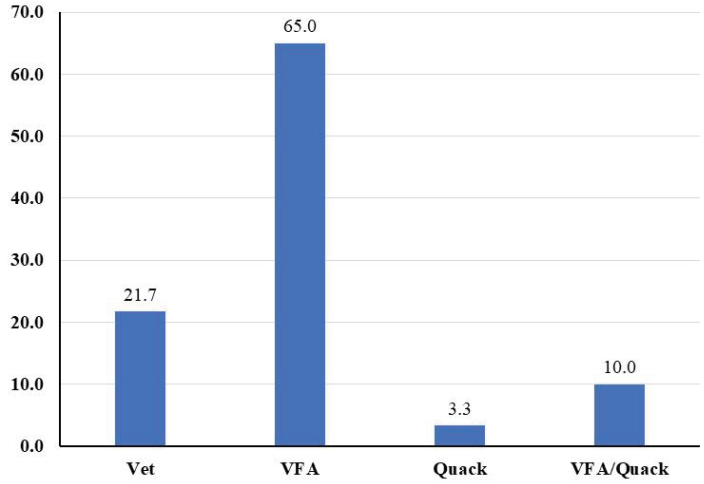


**Fig. 3. Personnel involved in treatment of reproductive problems.**

In study area, only 21.7% farmers called registered veterinary doctor (vet) for treatment, but in most cases, they called veterinary field assistant (65.0%). They also called Quack (3.3%) and VFA/Quack (10.0%) (Fig. 3). The main reason behind calling VFA or quack was lack of money and unavailability of veterinary doctors. On the other hand, in rural area, there is lack of veterinarian rather than quack.

***Assessment of the reproductive performance of dairy cows***

***Calving to first service and conception interval (CFSI)***

The mean CFSI and CCI of various genetic groups of dairy cows are shown in Fig. 4. In the current study, the average CFSI was 111.9 ± 18.0, 110.8 ± 21.9 and 106.4 ± 22.1 days in N, S or RS×N and HFC cows, respectively ($p>0.05$). But Temesgen *et al*. (2022) suggested that, cows should be serviced 60 to 80 days after parturition.

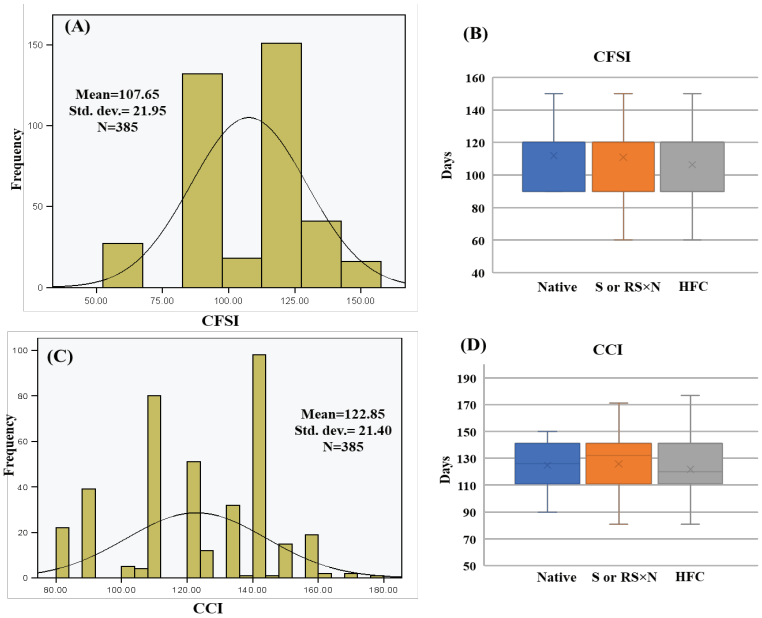


**Fig. 4. Information of calving to first service interval (CFSI) and calving to conception intervals (CCI) in dairy cows in Manikganj district. (A) Frequency distribution of CFSI, (B) Mean of calving to first service interval in N, S or RS×N and HFC cows, C) Frequency distribution of CCI, and (D) Mean of CCI in N, S or RS×N and HFC cows.**

On the other hand, average CCI in N, S or RS×N and HFC cows were 124.8 ± 20.0, 125.9 ± 21.8 and 121.7 ± 21.3 days, respectively (p>0.05). According to Temesgen *et al*. (2022), CCI should be 85 days to get a standard calving to conception interval annually. Factors that might have a significant effect on the CCI were the season of insemination, breeding system, calving to insemination interval, and herd milk yield level.

### *Number of services per conception*

The average number of services required per conception of various genetic groups of dairy cows is shown in Fig. 5. In the present study, it was found that the average service per conception of N, S or RS×N and HFC cows were 1.6 ± 0.5, 1.7 ± 0.6 and 1.8 ± 0.6, respectively (p>0.05). Several researchers reported that over all mean value for service per conception was 2.19 in native cows (Zebu cattle) in Bangladesh (Uddin *et al*., 2008; Mollah *et al*., 2015), 2.05 ± 1.47 in Holstein Friesian dairy cows in Ethiopia (Consentini *et al*., 2021) and 2.13 ± 0.037 in local (Sahiwal or Red Sindhi cross) dairy cows (Uddin *et al*., 2008; Mollah *et al*., 2015) in rural areas of Bangladesh. Therefore, it can be said that this study's results were less impressive than others. Breed, body weight/BCS, nutrition, semen quality, timing of insemination, skill of the AI worker, presence or absence of any diseases, and lastly the animal's general health status all affect the service per conception. It could be brought on by variations in the quantity and quality of semen used in AI, incorrect heat detection and timing of insemination and subpar husbandry practices.

### *Calving interval (CI)*

The average CI of N, S or RS×N and HFC cows were 409.4 ± 21.4, 412.4 ± 21.8 and 408.3 ± 21.0 days, respectively which did not differ significantly (Fig. 6). S or RS×N cows had the longest CI (412.4 ± 21.8 days), while HFC cows had the shortest (408.3 ± 21.0 days). The findings of this study agree with the range reported by Habib *et al.* (2003) for native cows (409.9 ± 17.8 days) in Bangladesh. However, Rahman *et al*. (2017) reported that the calving interval in case of HFC cows was 437.23 ± 11 days. Calving intervals can vary due to genetic, nutritional, environmental, and management factors. In addition to heredity, one of the causes of long CI in S or RS×N cows is that they were poorly fed and managed by low input farmers in contrast to HFC cows.

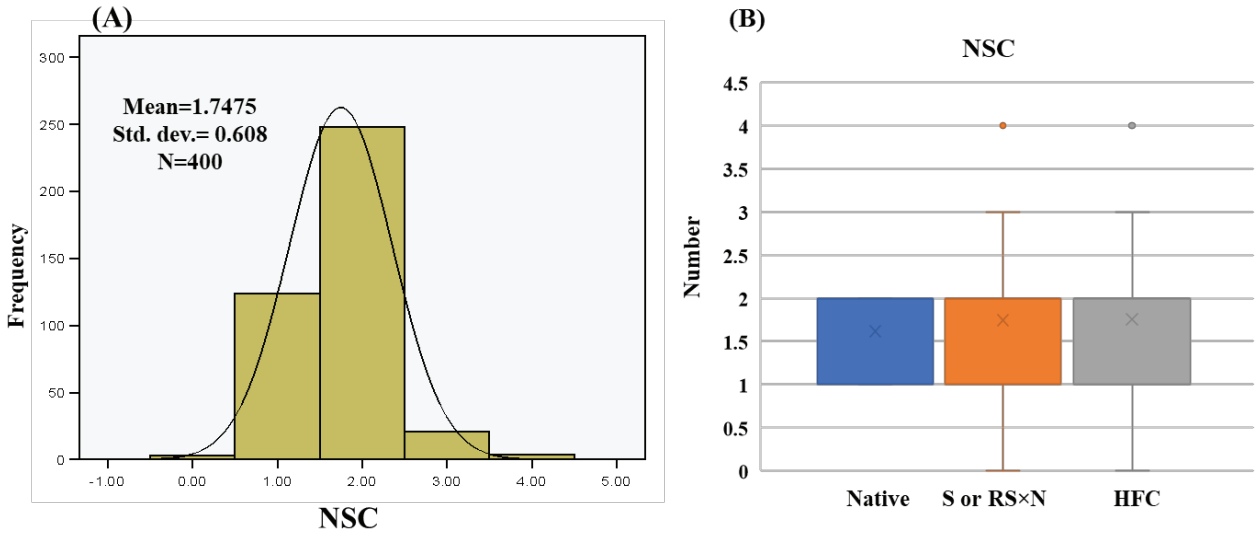


**Fig. 5. Information of number of services per conception (NSC) in dairy cows in Manikganj district. (A) Frequency distribution of NSC, (B) Comparison among NSC in N, S or RS×N and HFC cows.**

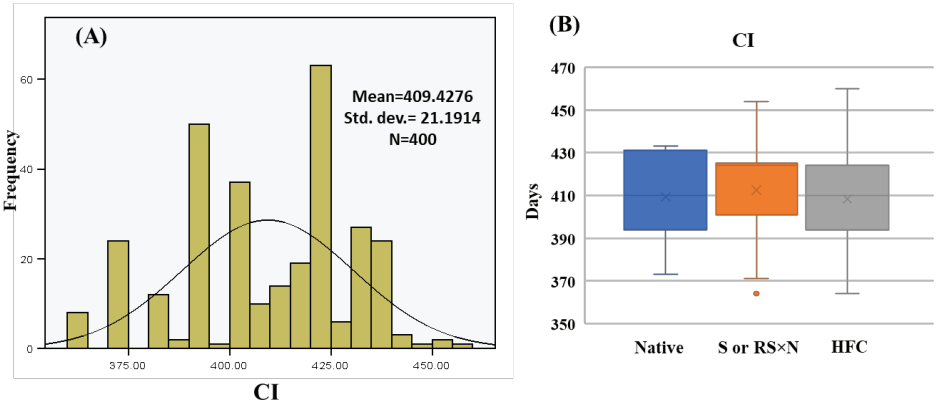


**Fig. 6. Information of CI in dairy cows in Manikganj district. (A) Frequency distribution of CI, (B) Comparison among CI (mean) in N, S or RS×N and HFC cows.**

**Prevalence and management strategies for reproductive health problems of cows**

The overall prevalence of reproductive health problems in cows during the study period was 29.5 % (118/400) (Fig. 7A). In the present study, various reproductive health problems were recorded such as anestrus, uterine infections (UTI), repeat breeding syndrome (RBS), cystic ovarian diseases (CODs), dystocia, retained placenta (RP), puerperal metritis, uterine prolapse, vaginal prolapse, abortion and premature and still birth. Among the reproductive health problems, the major reproductive diseases or disorders recorded with high prevalence included were dystocia (23.7%), UTI (16.1%), RP (16.1%) and premature and still birth (9.3%), whereas reproductive problems with lower incidence rate included anestrus, RBS, COD, puerperal metritis, uterine prolapse, vaginal prolapse, abortion were 2.5, 5.1, 1.7, 5.9, 7.6, 7.6 and 4.2%, respectively. Maaruf *et al.* (2012) stated that overall prevalence of reproductive disorders was 23% in dairy cows in Chittagong district of Bangladesh, which is quite similar to the findings of the present study.

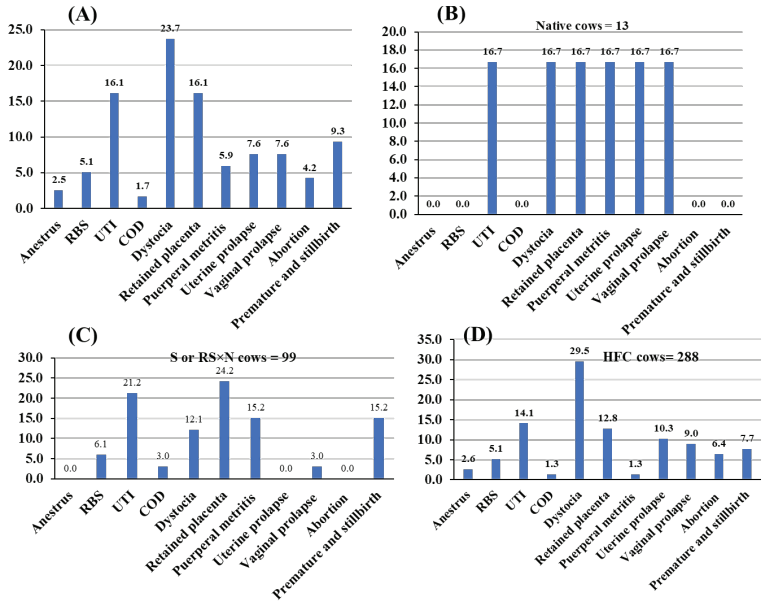


**Fig. 7. Prevalence of reproductive health problems in cows during study period. 7A) Overall prevalence of reproductive diseases and disorders in cows, 29.5% (118/400); 7B) Prevalence of reproductive diseases and disorders in native cows, 46.0% (6/13); 7C) Prevalence of reproductive diseases and disorders in S or RS×N cows, 33.3% (33/99); and 7D) Prevalence of reproductive diseases and disorders in HFC cows, 27.1% (78/288).**

The prevalence of reproductive health problems in native cows was 46.0% (6/13) (Fig. 7B). Among the reproductive health problems reported in native cows, the major reproductive diseases or disorders recorded with high prevalence in each case (16.7%) included were UTI, dystocia, RP, puerperal metritis, uterine prolapse, vaginal prolapse. However, no case of anestrus, RBS, COD, abortion was recorded in native cows. Likewise, the prevalence of reproductive health problems in S or RS×N cows was 33.3% (Fig. 7C). Likewise, among the reproductive health problems, the major reproductive diseases or disorders of S or RS×N cows recorded with high prevalence included were RP (24.2%), UTI (21.2%), premature and still birth (15.2%), puerperal metritis (15.2%) and dystocia (12.1%), whereas reproductive problems with lower incidence rate included RBS, COD, vaginal prolapse, were 6.1, 3.0 and 3.0%, respectively. However, no cases of anestrus, uterine prolapse, abortion were recorded in S or RS×N cows.

Similarly, the prevalence of reproductive health problems in H×F cows was 27.1% (Fig. 7D). Among the reproductive health problems, the major reproductive diseases or disorders recorded with high prevalence included were dystocia (29.5%), UTI (14.1%), RP (12.8%), uterine prolapse (10.3%) and vaginal prolapse (9.0%), whereas reproductive problems with lower incidence rate included anestrus, RBS, COD, puerperal metritis, abortion, premature and still birth were 2.6, 5.1, 1.3, 1.3, 6.4, and 7.7% respectively. Maaruf *et a*l. (2012) stated that overall prevalence of reproductive disorders was 23% in dairy cows in Chittagong district of Bangladesh, which is quite similar to these findings. In general, it is recommended that poor management systems, lack of routine and periodical examination of cows, imbalanced feeding, and unhygienic condition were responsible for the incidence of reproductive health disorders and associated risk factors in the study area. The majority of the dairy farmers in that area were unconcerned about disease treatment.

## Conclusion

The majority of dairy farmers in study areas used visual observation method for estrus detection, AI for breeding, rectal palpation (90-120 days) for pregnancy diagnosis, maintained breeding record, optimum BCS and supplemented vitamin-minerals during late pregnancy as well as pursue veterinary services for management of reproductive health problems. However, farmers did not apply any estrus detection aids, estrus synchronization program, ultrasonography and assay for pregnancy diagnosis, and also did not maintain dry cow management, hygienic environment during parturition and VWP. Interestingly, the reproductive performance (CFSI, CCI, NSC and CI) of cows, mostly fall within the reproductive goals indicating profitable dairy farming in study areas. Nevertheless, reproductive performances were influenced by the genetics of the cows. Overall, the major reproductive health problems recorded with high prevalence included were dystocia, UTI and RP, whereas lower incidence rate was anestrus, RBS, COD, puerperal metritis, uterine prolapse, vaginal prolapse, abortion in the study areas, and the prevalence of reproductive diseases and disorders was lowest in HFC cows followed by S or RS×N and native cows during the study. Therefore, reproduction management practices were good in majority of farms, but need to improve and performance of cows are acceptable and mostly fall within the reproductive goals for sustainable production. Furthermore, treatment of reproductive health problems with registered veterinarian can also be taken into considerations by the farmers for maximizing dairy production and farm income.

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