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Study on the Reproductive Performance and Problems in Crossbred Cows in Jalalabad, East of Afghanistan

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Abstract. Livestock production is one of the most important economic and social activities in agriculture in Afghanistan. The present study aims to survey the reproductive performance of crossbred cows to address any major constraints of their reproduction in Afghanistan. Body condition, reproductive disorders, and feeding schemes were surveyed in 144 cows of 7 dairy farms in Jalalabad city. In this survey, we found that 55.6% dairy cows had reproductive disorders, among them "anestrus" showed the highest percentage. Cows with a lower body condition score (BCS) showed a greater incidence of anestrus, with a significant difference in the occurrence of anestrus between BCS 1 and BCS 3. Further, cows fed with only straw tended to show lower BCS compared with animals fed with both straw and concentrates. In conclusion, the present study suggests that the low BCS of cows, which is possibly caused by a poor feeding scheme, is closely associated with a higher occurrence of anestrus in cows. The present study may contribute to proposing improvements in feeding schemes that may in turn increase the reproductive performance of crossbred cows in Afghanistan.

Key words: Reproductive performance, problems, crossbred cows, Afghanistan

Introduction

Livestock production is one of the most important economic and social activities in agriculture in Afghanistan: 46% of the land area in the country was estimated to be used for meadows and pastures, which covers up to 79% of the total agricultural land[1)]. Livestock products contribute to 15% of agricultural GDP and are suggested as one of the most promising industries in Afghanistan[2)]. On the other hand, the negative impact on food security caused by the armed conflicts still continues in the country. Approximately 30−40% of the total population are estimated being under severe or moderate food-insecurity[3, 4)], of which 4.3 million people (which counts for 16% of the total population of the country) are in urgent need for assistance to access food[5)]. Improvement of livestock production is required for the security of nutritious food in Afghanistan, especially in the dry rural areas where the farmers largely rely on livestock for income.

Cattle provides the largest portion of meat and milk products among livestock in Afghanistan[1)]. The total number of cattle kept in Afghanistan was 3.7 million in 2002–2003[6)] and the largest number of cattle were kept in Nangarhar and Badakshan provinces, where over 0.3 million of cattle are farmed[6)]. According to Zafar[7)], before the war in the 1970's, bulls for exotic breeds and their semen for crossbreeding with local breed cows had been reared in governmental farms located in provinces including Nangarhar. Until now, some of the governmental farms

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and artificial insemination centers continue to provide artificial insemination with the semen from Friesian and Jersey bulls[7].

Reproductive performance is a key trait for cattle production, because successful pregnancy, gestation and lactation of cows directly leads to economic return for the farmers, as well as an increase in animal production, which could provide efficient nutrients (protein) to people. In the surrounding countries of Afghanistan, such as Iran[8] and Pakistan[9], reproductive performance of cows, such as estrus cycle, fertilization, pregnancy period, calving interval, estrus cycle detection rate after parturition[10] have been described, whereas such information is extremely limited and scarce in Afghanistan. Thus, the present study aimed to investigate the reproductive performance of crossbred cows in Afghanistan and address major constraints in their reproduction. We initially identified seven cattle producing farms in Jalalabad city, where recorded reproductive history is available in each crossbred cow within the previous year from the survey date, as well as the body condition score (BCS) on the date of the survey. This study will also serve as an entry point for further surveys at a larger scale within the country, which may contribute to improving reproductive performance of cows in Afghanistan.

Materials and Methods

Selection of the study site

The present survey was conducted from 15th February to 15th March 2016 in Jalalabad city, located in Nangarhar, an eastern province of Afghanistan. It is located at latitude 34.43 N and longitude 70.45 E, and elevated at 575 meters above the sea level. The province was previously identified to hold the largest number of cattle population in the country, according to the national census[6]. Seven farms, including one governmentally and six privately owned, were selected, because these farms have complete background records of the cows such as breeds, age, reproductive performance and reproductive disorders, and their cows were regularly checked by their private veterinarians. The veterinarians cooperated with the interviewers during the present survey.

Animal husbandry

All 144 cows kept in the seven farms were crossbreed of Afghan native breed, Kandahari, and exotic breeds (Holstein and Brown Swiss). According to the locals, the Kandahari breed is originated from Kandahari province, Afghanistan, and known as one of the oldest and most preferred native breed among the farmers. Before the war, the exotic cattle were kept at governmental dairy farms at Jalalabad and other districts of Nangarhar province to provide the bulls to rural farmers for crossbreeding. The governmental farms were looted during the war and the cattle were taken to private farms. Currently there is no documented information about pedigree of these cows nor stable system to provide artificial insemination and/or breeder bulls, as a result of the influence of the war. Therefore, the farmers practiced artificial insemination or mating depending on available services, and the information on pedigrees, such as filial generations from the parental strains, was not available in the record kept at the farms.

Fifty-four cows in one farm were fed with only wheat straw and ninety cows in the other six farms were fed with combination of hay, wheat straw and concentrate. The hay was mainly produced from Shaftal Persian clover (*Trifolium resupinatum*), which is one of the most popular fodders in Afghanistan according to the previous case study by FAO[11]. As concentrate, farmers used local cereal crops, such as maize bran, cotton seed cake, wheat and corn.

The farmers who used the mixed feeds with hay, wheat straw and concentrate changed their feeding practice seasonally. During winter, the farmers fed the animals with dried hay and concentrate in the daytime and with only wheat straw in the nighttime. During summer, the wheat straw was mixed with green hay and concentrate and there was no change in the feeding practice from daytime to nighttime. The approximate portion of the wheat, hay and concentrates, when they were mixed, were 45%, 45%, and 10%, respectively, according to the interviewer's observation.

Implementation of the survey

Seven dairy farms in total were visited by trained interviewers together with private veterinarians who regularly serve for these farms. A close-ended questionnaire was designed prior to the interview and interviews were conducted at each farm in presence of the cattle. Questions were answered by head of the farms, family or labor, who were mainly responsible for the animals. The farmers' records on notebooks that had all previous records of the herds were also checked at the site.

Questionnaire

The questionnaire was prepared in the local language (Pashto). All questions asked during the survey are shown in Table1. The first question pertained to the feeds for all the cattle at each farm. All other questions were asked regarding each individual cow in the herd. All cows that have ever experienced at least one conception were targeted for the survey. Bulls and prepubertal heifers were excluded from the survey, because the present study focused on reproductive performance of adult females.

Table 1. Questionnaire on reproductive performance and feed condition of cows

Questions
Type of food (A= Straw, B= Hay, C= Concentrate)
Breed of cow
Age of cow
BCS (1, 2, 3, 4, 5)
No. of total parturition
No. of total abortion
No. of total dystocia
No. of repeat breeder
Length of anestrus
Other diseases

Diagnosis of anestrous and history of reproductive disorders

Estrus was detected by observation of standing estrous behavior and visual inspection of mucus from genital area. Animals that had shown no estrus, and therefore undergone no mating nor artificial insemination, during the previous 3 months or longer were diagnosed as "anestrus" unless they were pregnant. The history of reproductive disorders in the last year was collected from the farmers' records.

Body condition score (BCS)

Body condition was scored in order to assess the nutritional status of the animal by visual inspection by the interviewers on the day of the survey. A five-point condition scoring system was used in the current survey as previously described[12]. All the animals were grouped into one of five categories1, 2, 3, 4 and 5, for very poor, poor, fair, fat and very fat conditions, respectively. The scoring was determined by palpation and visualization of the transverse and spines processes for the lumbar vertebrae (loin) and pins, hooks tail head shapes, respectively.

Statistical analysis

The difference in the number of cows diagnosed as anestrus between BCS groups was analyzed by using Fisher's exact test with Benjamini and Hochberg false discovery rate controlling procedure (R version 3.2.0, http://www.R-project.org/).

Results

Number, age and BCS of animals

In the surveyed 7 farms, 144 cows were present. Numbers counted in each age group are shown in Table 2. Among the all cows, the median age was 5 years old, ranging from a minimum of 1.5 years old to a maximum of 14 years old. The largest number of cows scored 3 in BCS (n=73), followed by 2 (n=60), 1 (n=9) and 4 (n=2) as shown in Figure 1. No cow was scored as 5 in BCS in the present survey.

Table 2. Number of cows grouped by age

Age group (yrs)	Number of cows
1.5~2	8
3	21
4	23
5	22
6	11
7	13
8	27
9	1
10	7
11	1
12	4
13	2
14	4
Total	144

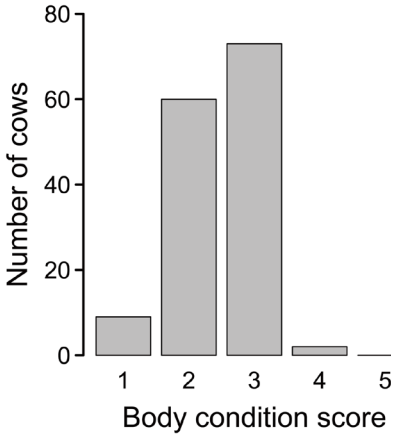

Fig. 1. The number of crossbred dairy cows showing 1 to 5 of body condition score (BCS). The BCS was determined according to the 5-point condition scoring system as previously described[12]. 144 cows in total were surveyed in 7 farms in Jalalabad in East-Afghanistan. Note, no cow with 5 of BCS was found in the current study.

Number of parturitions

The number of parturitions recorded for each cow during its lifetime are shown as a sunflower plot in Figure 2. The majority of cows showed their first parturition by the age of 3 or 4 years old. As the age of the cows increased, the median (indicated as grey bar) of the parity increased by approximately one between 2 and 13 years old. Some females have never shown parturition by the age of 8 years old.

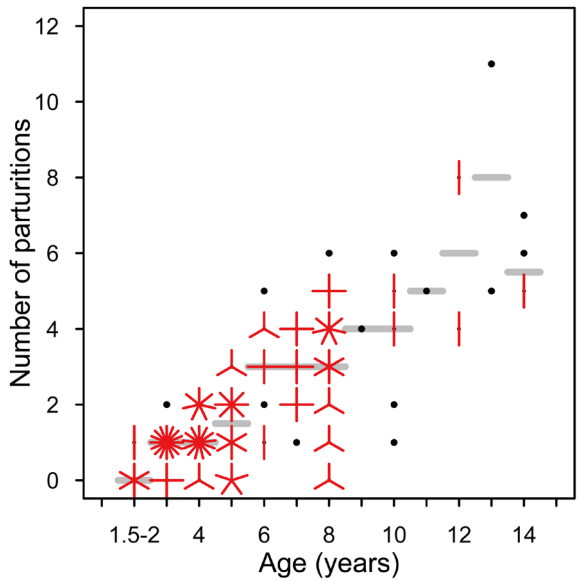

Fig. 2. The number of parturitions recorded during the lifetime of each cow. Black dot indicates there was one cow observed at the coordinate value. When two or more cows were observed at the same coordinate value, the number of the cows were expressed as the numbers of "petals" in red. Median among each age group are indicated by grey horizontal bars.

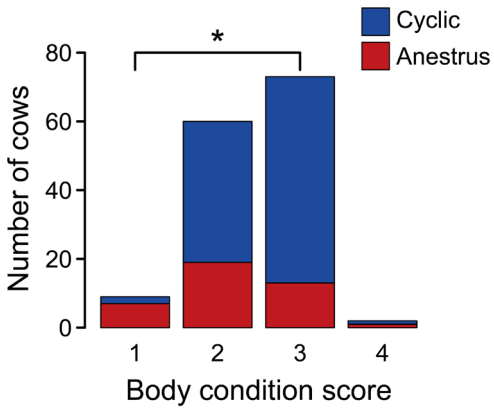

Fig. 3. The number of the cows diagnosed as anestrus (■) and cyclic (■) in each BCS group. Cows which had shown no estrus during the previous 3 months or longer was diagnosed as anestrus. There was a significant difference in the occurrence (percentage) of anestrus between BCS1 and BCS3 ($p<0.01$ by Fisher's exact test with Benjamini and Hochberg false discovery rate controlling procedure).

Reproductive disorders

The number of animals with reproductive disorders in the last year is shown in Table 3. Eighty cows out of 144 were diagnosed as having reproductive disorders, which is equivalent to 55.6% of the total cows observed. Among the diagnosed cows, the largest number were anestrus, which counts for 20.1% of the total cows observed, followed by metritis (9.0%) and repeat breeding (5.6%), which is defined as the failure of fertilization after two or more insemination trials. Fourteen cows showed two or more of the disorders, such as abortion, anestrus, dystocia, vaginal prolapse and repeat breeders (9.7%).

Occurrence of anestrous and feeds

The number of the cows diagnosed as anestrus in each BCS group is shown in Figure 3. As the BCS increased, the percentage of the cows diagnosed as anestrus in all cows with the same BCS decreased. The percentage of cows showing anestrus in each BCS group was as follows: BCS1, 77.8%; BCS2, 31.7%; BCS3, 17.8%; BCS4, 50.0%. There was a significant difference in the occurrence (percentage) of anestrus between BCS1 and BCS3 ($p<0.01$ Fisher's exact test with Benjamini and Hochberg false discovery rate controlling procedure). Figure 4 shows that cows fed with only straw tended to show a lower BCS compared with cows fed with straw, hay and concentrates.

Table 3. Number of cows diagnosed with reproductive disorder

Reproductive disorder	Number of animals	%
Abortion	6	4.2
Anestrous	29	20.1
Dystocia	6	4.2
Repeat breeding	8	5.6
Retain placenta	1	0.7
Metritis	13	9.0
Vaginitis	3	2.1
Mixed	14	9.7
Total	80	55.6

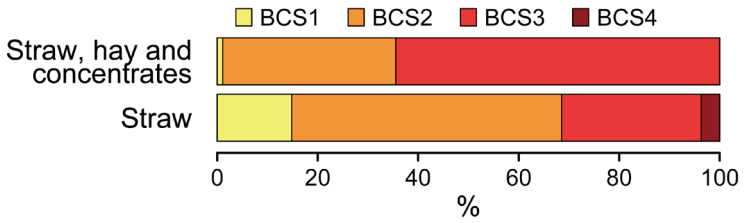

Fig. 4. The percentage of cows showing each BCS in two groups categorized by the feed; a group fed with straw, hay and concentrates (n=90); the other group fed with only straw (n=54). BCS 1 (■), BCS 2 (■), BCS 3 (■) and BCS 4 (■).

Discussion

The present study demonstrates that anestrus is possibly the largest constraint in the reproductive performance of Afghan crossbred cows in Jalalabad city and that a poor feeding scheme may mainly be the cause of anestrus in the local farms in the area, because the present study showed that cows with a poor BCS were highly associated with the occurrence of anestrus and that the BCS correlated with the type of feeds. These results suggest that an improvement in the feeding scheme may contribute to improving the reproductive performance of crossbred cows in Afghanistan.

It is well known that the reproductive performance of cows is often affected by nutrition[13, 14]. Low nutritional feeding after parturition has negative effects on pulsatile luteinizing hormone (LH) release in dairy cows[15, 16]. Negative energy balance, caused by deficiencies in food content and/or total dry matter intake, results in delaying the first ovulation and decreasing reproductive efficiency in cattle[17]. Indeed, the cows whose body condition was poor during early lactation appear to be at risk for delayed ovulation, delayed first insemination, and low conception rate[13]. A previous study also indicated that poor body condition during the early postpartum period caused long calving intervals and that poor nutrition impaired ovarian function, resulting in repeat breeding in crossbred (Holstein x Sahi-wal) dairy cows in the Philippines[18]. Further, nutritional status is largely correlated with reproductive performance in cattle: when nutrition is improved, particularly during the pre-partum period, postpartum anestrus and calving intervals are reduced; when BCS is adequate at calving, the interval to conception is reduced[14]. An increase in nutrient intake during the pre-partum period substantially improves pregnancy rate compared with beef cows that experience a low nutrient intake until parturition[19]. On the other hand, an inadequate nutrient intake causes loss of weight and a low BCS, finally resulting in the cessation of estrous cycles in cattle[13]. These studies are largely consistent with our current findings, showing that cows fed only with straw were highly associated with anestrus. Wheat straw alone is insufficient as feed for dairy cows, because the total digestive nutrient can be as low as 38%[20], which only supplies energy for survival of the individual cow. Further, cows fed with only straw tended to show a lower BCS compared with animals fed with straw, hay and concentrates, suggesting that an improvement of the feeding scheme is required to improve the BCS and consequently reproductive performance in cows. It is also noteworthy that two cows fed with only straw showed higher BCS compared with others, implying that the BCS could be improved by other environmental factors, such as better management of sheds and sanitation, than only feedings. Individual variation of physiological conditions also needs to be taken into account, because residual feed intake (one of the major indices of feed efficiency in ruminants) varies depending on metabolism, thermoregulation or physical activities of individual animals[21].

The BCS is one of the most useful indicators to understand the animal nutrition and reproductive status in dairy cows, because the present study showed that the lower the BCS, the higher the percentage of cows that showed anestrus. The notion is consistent with previous studies showing that estrus cycle can be estimated with the BCS and that the time of the delivery to the next estrus can be estimated by BCS in the Japanese anestrus Holstein dairy cows[22]. Indeed, an excessively low BCS results in an unsuitable condition for estrus cycle and fertility in Holstein dairy cows: Cows that have a low BCS have low estrus and pregnancy rates than cows with a moderate BCS as seen in Nellore cows[23]. Interestingly, 'fatty condition' also can have a negative influence on reproductive performance in cows. In fact, the pregnancy rate was higher in cows that showed moderate BCS than thinner or fatter cows[23]. Thus, the feeding programs designed to maintain cows at a moderate BCS from pre-calving through rebreeding are required to improve reproductive performance in cows[23].

The present study revealed that 55.6% of dairy cows in the survey have reproductive disorders and that "anestrus" was the major disorder and some anestrous cows also afflicted with additional reproductive disorders, such as metritis repeat breeding. The result is consistent with previous studies, indicating that anestrus is major reproductive problem, which is often accompanied with repeat-breeding, dystocia, retained fetal membranes, endometritis and abortion in crossbred dairy cattle in Mekelle, Ethopia[24], Hosanna, Ethopia[25] and Ho Chi Minh, Vietnam[26]. Further, the present survey showed that some cows have never shown parturition by the age of 8 years old. It is speculated that an improvement of nutritional status may solve anestrus and other accompanying reproductive disorders that may consequently facilitate reproductive performance in Afghan cows.

In conclusion, the present study showed that cows with a poor BCS were highly associated with the occurrence of anestrus and that BCS was associated with the type of feed. These results suggest that an improvement in the feeding scheme may contribute to improve the reproductive performance of crossbred cows in Afghanistan.

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