International Journal of Animal Science and Technology
2018; 2(2): 23-29
http://www.sciencepublishinggroup.com/j/ijast
doi: 10.11648/j.ijast.20180202.11

Existing Animal Husbandry Practices in Narmada District of Gujarat in India

Ram Singh

Buffalo Nutrition Division, ICAR-Central Institute for Research on Buffaloes, Hisar, India

Email address:
carirsingh@yahoo.co.in

To cite this article:
Ram Singh. Existing Animal Husbandry Practices in Narmada District of Gujarat in India. *International Journal of Animal Science and Technology*. Vol. 2, No. 2, 2018, pp. 23-29. doi: 10.11648/j.ijast.20180202.11

Received: August 6, 2018; **Accepted**: August 19, 2018; **Published**: September 17, 2018

Abstract: The present study was undertaken to document the existing animal rearing practices adopted by the farmers in Narmada district of Gujarat in India. In each of the four talukas comprising Narmada district, 25 animal keepers were selected randomly forming a total of 100 respondents. The study revealed that 48.00% of the respondents reared indigenous cattle along with buffaloes followed by 18.00% indigenous cattle only, 13.00% buffaloes only, 9.00% indigenous along with crossbred cattle, 5.00% crossbred cattle only, 4.00% crossbred cattle along with buffaloes and 3.00% indigenous cattle along with crossbred cattle and buffaloes. The indigenous cattle breeds of the region were Gir, Dangi and nondescript; and the breeds of buffaloes were Surti, Mehsana and nondescript. The milk yield of the indigenous cattle, reared by 68.00% of the farmers was less than 2 litres per day. Majority of the respondents reared medium sized herd dominated by indigenous cattle along with buffaloes. 46.00% of the respondents used mucus and bellowing together to identify estrous in animals followed by mucus discharge alone (38.00%), frequent urination (15.00%) and mounting (1.00%). 88.00% of the respondents got their animals inseminated within 12-18 h of heat detection. In buffaloes, 93.00% of the respondents observed calving interval (CI) of more than 15 months, 7.00% reported CI between 13-15 months. In buffaloes, 90.00% of the respondents observed dry period of more than 3 months, 9.00% between 2-3 months and 1.00% less than 2 months. 10.00% of the respondents practised full hand method of milking, 3.00% stripping and 87.00% knuckling. It was concluded that indigenous cattle and buffaloes were important species of livestock in Narmada district of Gujarat which was lacking in proper health care practices like vaccination, deworming and treatment of livestock. The lack of scientific animal rearing causing poor animal production was the major impediment in good animal husbandry.

Keywords: Animal Husbandry, Cattle, Buffalo, Narmada, Gujarat

1. Introduction

Crop husbandry and animal husbandry are two main pillars of Indian agriculture which play crucial role in Indian economy. Animal husbandry particularly dairy development has great potential and prospects for eradicating rural poverty and bringing the rural masses above poverty line. Dairy development can provide employment opportunity to earn livelihood for weaker strata of society [17] and also improve their nutritional status through milk consumption. The major constraints in animal husbandry faced by farmers of South Gujarat were high cost of feed, non-availability of green fodder round the year, lack of knowledge of balanced ration, silage preparation and treatment of poor quality straw to improve its nutritive value [1, 2]; repeat breeding, low conception rate, lack of insemination facility in time, lack of improved bulls for breeding, and lack of knowledge of heat detection, high cost of veterinary medicine, problem of mastitis, inadequate knowledge of diseases and their control and non-availability of veterinary services regularly [1]. Profitable dairy farming demands the availability of good quality feeds and fodder for the animals, proper health management and breeding practices. It is thereby, important to collect information to know the extent of scientific practices adopted by the farmers. The objective of the present study was to study the existing animal husbandry practices in Narmada district of Gujarat. The information incorporated in this communication is on the basis of visiting professional which has sufficient reliability to formulate animal husbandry development policies and programmes.

2. Materials and Methods

The present study was undertaken to document the existing animal husbandry practices in Narmada district of Gujarat in India. Narmada district consists of 4 talukas, which includes Nandod, Sagbara, Tilakwada and Dediapada. The district headquarter is in Rajpipla which is located in Nandod. A detailed proforma to collect information based on socio-economic profile of the respondents; and existing animal reproduction, health and milking management practices was developed. Only important parameters which had some relevance regarding adoption of scientific animal rearing practices were included. In each of the four talukas, 25 animal keepers were selected randomly forming a total of 100 respondents. The significance and objective of the information to be collected were made clear to all the respondents that the information will be utilised for research purpose. The respondents were contacted during their leisure time and the interactions were arranged in an informal way.

3. Results and Discussion

3.1. Socio-Economic Profile of the Respondents

The socio-economic profile (age, family size, education, land holding, occupation, animal herd size and its composition and milk production) of farmers is given in Table 1. The results showed that 11.00% of the respondents were young i.e. below 30 years of age, 49.00% middle aged and 40.00% above the age of 50 years. 24.00% of the respondents were from small sized, 59.00% from middle sized and 17.00% from large sized family. 48.00% of the respondents had primary level education followed by matriculation (32.00%), illiterate (18.00%), graduation (02.00%). With regard to land holding, 40.00% of the respondents were small having 2.6 to 5.0 acre of land followed by large (25.00%) having > 5 acre and marginal (23.00%) farmers having <2.5 acre of land holding. Landless labourers constituted 12.00% of the total respondents. In the case of herd composition i.e. type of animals reared, 48.00% of the respondents reared indigenous cattle along with buffaloes followed by 18.00% indigenous cattle only, 13.00% buffaloes only, 9.00% indigenous along with crossbred cattle, 5.00% crossbred cattle only, 4.00% crossbred cattle along with buffaloes and 3.00% indigenous cattle along with crossbred cattle and buffaloes. The indigenous cattle breeds of the region were Gir, Dangi and nondescript and the breeds of buffaloes were Surti, Mehsana and nondescript.

Table 1. *Socio-economic profile of the farmers.*

S.No.	Attributes	Group	No. of Respondents (n=100)
1.	Age	Young (<30 Y)	11.00
		Middle aged (30-50 Y)	49.00
		Old aged (>50 Y)	40.00
2.	Family size	1-5	24.00
		5-8	59.00
		>8	17.00
3.	Education	Illiterate	18.00
		Primary	48.00
		Matriculation	32.00
		Graduate	02.00
4.	Land holding	Landless labourers	12.00
		Marginal farmers	23.00
		Small farmers	40.00
		Large farmers	25.00
5.	Animal herd size	Small (1-5)	25.00
		Medium (6-10)	56.00
		Large (>10)	19.00
6.	Herd composition	Indigenous cattle	18.00
		Crossbred cattle	05.00
		Indigenous + Crossbred cattle	09.00
		Buffalo	13.00
		Indigenous cattle + Buffalo	48.00
		Crossbred cattle + Buffalo	04.00
		Indigenous + Crossbred cattle + Buffalo	03.00
7.	Occupation	Agriculture	03.00
		Livestock	09.00
		Agriculture + livestock	88.00
8.	Indigenous cattle Milk yield (litre/day)	<2 litres	68.00
		2-4 litres	23.00
		>4 litres	09.00
9.	Crossbred cattle Milk yield (litre/day)	<3	11.00
		3-10	77.00
		>10	12.00
10.	Buffalo Milk yield (litre/day)	<3	18.00
		3-5	61.00
		>5	21.00

The study further revealed that 88.00% of the respondents adopted mixed farming (crop and livestock) system, however, 3.00% agricultural crops only and 9.00% livestock rearing only. On an average, the milk yield of the indigenous cattle, reared by 68.00% of the farmers was less than 2 litres per day. Indigenous cattle yielding 2-4 litres milk were reared by 23.00% of the households and yielding >4 litres milk per day were reared by 9.00% of the households. In the case of crossbred cattle, cows yielding 3-10 litre per day were reared by 77.00%, yielding <3 litres by 11.00% and yielding >10 litres by 12.00% of the households. With regard to buffalo husbandry, 61.00% of the farmers reared buffaloes yielding only 3-5 litres milk, 18.00% yielding <3 litres milk and 21.00% yielding >5 litres of milk per day. This finding of low milk yield in indigenous cattle, crossbred cattle and buffaloes was in agreement with that reported earlier [20]. The results of the present study indicated that majority of the respondents reared medium sized herd dominated by indigenous cattle along with buffaloes and the average milk production per animal was very poor. Low milk production is one of the major constraints faced by the dairy animal owners of South Gujarat [1]. In order to improve production performance of these animals (Gir, Dangi, nondescript for indigenous cattle and Surti, Mehsana, nondescript for buffaloes), genetically improved through high pedigreed and genetically proven bulls suitable for the region should be used. Thus, genetic improvement of these animals for higher milk production, reduced age at first calving, reduced service and dry period and reduced calving interval will definitely lead to higher economic returns. In the study area, Gir for indigenous cattle and Surti for buffaloes were the breeds of choice for genetic improvement of animals [22].

3.2. Reproduction Management Practices

The data pertaining to various reproductive traits is given in Table 2. 46.00% of the respondents used mucus and bellowing together for heat detection in animals followed by mucus discharge alone (38.00%), frequent urination (15.00%) and mounting (1.00%). These findings were in agreement with [3] who reported that farmers also resort to frequent urination for heat detection in animals. In Punjab, estrous detection was mainly noticed by milk let down and milk retention even after milking in buffaloes locally known as DOKA along with vaginal discharge [4]. Several of the respondents reported that the heat detection symptoms were more noticeable in the morning hours and during winter season as compared to summer. These findings were in agreement with those reported earlier [5, 6]. The present study further revealed that 21.00% of the respondents got their animals impregnated by AI, 40.00% followed natural insemination and 39.00% used both AI along with natural service together. This result was in agreement with [8] who also reported that farmers of Gujarat got their animals inseminated by AI and breeding bulls together to achieve better conception. In the present study, low percentage of AI was due to poor conception rate with AI. Thus, low conception rate was one of the major constraints of animal rearing. This result was in agreement with those of earlier reports [25, 26]. In the present study, majority of the respondents followed natural insemination. This finding was in agreement with earlier report [7] who also reported high percentage of natural service practised by farmers in Bareilly district of Uttar Pradesh which might be due to high conception rate in natural service. Estrous detection and getting the animal inseminated at proper time is very important for higher conception rate. 88.00% of the respondents got their animals inseminated within 12-18 h of heat detection and 11.00% after 18 h. Only 1 of the respondents told that he took the animal to AI centre or breeding bull soon after heat detection. The present study revealed that almost every farmer got his animal inseminated after 12 h of heat detection. Similar finding was also reported earlier [9] wherein majority of the farmers got their animals inseminated between 12-24 h of heat detection. 79.00% of the respondents did not practise pregnancy diagnosis which influence calving interval of animals, only 21.00% practised pregnancy diagnosis.

Table 2. *Reproduction management practices in Narmada district.*

S.No.	Attributes	Category	No. of Respondents (n=100)
1.	Symptoms of heat detection	Mucus discharge	38.00
		Mucus + bellowing	46.00
		Mounting	01.00
		Frequent urination	15.00
2.	Impregnation of females	Artificial Insemination	21.00
		Natural Service	40.00
		Both	39.00
3.	Time of insemination	Immediately after heat	01.00
		Within 12-18 h	88.00
		After 18 h	11.00
4.	Pregnancy diagnosis	Followed	21.00
		Not followed	79.00
5.	Breeding after calving	2-3 months	07.00
		3-5 months	25.00
		>5 months	68.00
6.	Indigenous cattle dry period	<2 months	01.00
		2-3 months	10.00

S.No.	Attributes	Category	No. of Respondents (n=100)
		>3 months	89.00
		<2 months	03.00
7.	Crossbred cattle dry period	2-3 months	71.00
		>3 months	26.00
		<2 months	01.00
8.	Buffalo dry period	2-3 months	09.00
		>3 months	90.00
		12-13 months	00.00
9.	Calving interval indigenous cattle	13-15 months	15.00
		>15 months	85.00
		12-13 months	09.00
10.	Calving interval crossbred cattle	13-15 months	66.00
		>15 months	25.00
		12-13 months	0.00
11.	Calving interval buffalo	13-15 months	07.00
		>15 months	93.00
		6-12 months	05.00
12.	Castration age	12-24 months	16.00
		>24 months	79.00
13.	Breeding record maintained	Yes	17.00
		No	83.00

In case of breeding after calving, 68.00% of the respondents got their animals inseminated after 5 months of calving followed by 25.00% after 3-5 months and 7.00% after 2-3 months. Earlier insemination of animals indicates better management and more profit [10, 11]. The study further revealed that 89.00% of the respondents observed dry period of more than 3 months followed by 10.00% between 2-3 months and 1.00% less than 2 months. In case of crossbred cows, 71.00% of the respondents observed dry period between 2-3 months followed by 26.00% more than 3 months and 3.00% less than 2 months. For buffaloes, 90.00% of the respondents observed dry period of more than 3 months followed by 9.00% between 2-3 months and 1.00% less than 2 months. The study further revealed that 85.00% of the respondents observed CI of more than 15 months, 15.00% between 13-15 months. Majority of the respondents reported long dry period in their animals which was due to lack of scientific breeding practices. This finding was in agreement with those reported earlier [18, 19]. In the case of crossbred cows, 66.00% observed CI between 13-15 months followed by 25.00% more than 15 months, and 9.00% between 12-13 months. In the case of buffaloes, 93.00% observed CI of more than 15 months, 7.00% between 13-15 months. The present study revealed that CI of indigenous cows and buffaloes was more than the crossbred cows. It was further reported that 79.00% of the respondents performed castration at the age of more than 24 months followed by 16.00% at 12-24 months, and 5.00% at 6-12 months. The study further revealed that 83.00% of the respondents maintained no breeding record, however, 17.00% maintained incomplete breeding records.

3.3. Health Management Practices

The data pertaining to health management practices (vaccination, novel cord disinfection, deworming, debudding, control of ectoparasites and treatment of sick animals) is presented in Table 3. The results revealed that 56.00% of the respondents got their animals vaccinated against Foot and Mouth disease (FMD), Black Quarter (BQ) and Haemorrhagic septicaemia. Higher percentage of vaccinated animals could be due to no cost of vaccination in the region. However, 44.00% of the respondents did not get their animals vaccinated simply because of ignorance. These findings were in agreement with [7] who also recorded 51.00% vaccination in animals in Bareilly district of Uttar Pradesh which was due free of cost vaccination done by Indian Veterinary Research Institute, Izatnagar in rural areas of the district. The results further revealed that 98.00% of the respondents did nothing for navel cord disinfection, only 2.00% practised navel cord disinfection. This finding was in agreement with that reported earlier [16]. Disinfection of navel cord in 37% cases in buffaloes owners in Jhunjhunu district of Rajsthan was also reported [12]. Also, disinfection of navel cord by 31.00% of the respondents in tribal farmers of Pune district in Maharastra was reported [13]. In the present study, high calf mortality was also reported by the farmers which could be due to lack of awareness regarding care of new born. With regard to navel cord disinfection, it should be cut leaving two inches, the contents be squeezed out, dipped in iodine tincture and tied using clean thread to prevent infection.

Table 3. *Health management practices.*

S.No.	Attributes	Category	No. of Respondents (n=100)
1.	Vaccination (FMD, HS, BQ)	Yes	56.00
		No	44.00
2.	Navel cord disinfection	Yes	02.00
		No	98.00
3.	Deworming in full grown animals	Regular	01.00

S.No.	Attributes	Category	No. of Respondents (n=100)
		Occassional	19.00
		Not practiced	80.00
		Regular	18.00
4.	Deworming in calves	Occassional	54.00
		Not practiced	28.00
5.	Debudding	Yes	11.00
		No	89.00
6.	Control of ectoparasites	Yes	18.00
		No	82.00
		Traditional knowledge	05.00
7.	Treatment of animals	Livestock inspector	51.00
		AI workers	23.00
		Veterinary officers	21.00

In the present study, 80.00% of the respondents did not practise deworming, 19.00% practised deworming occasionally and 1.00% practised deworming regularly in full grown animals. In the case of new born calves, 18.00% of the respondents practised deworming regularly, 54.00% occasionally and 28.00% did not practise at all which was due to ignorance and lack of knowledge about harmful effects of endoparasites. These findings were in agreement with that [7, 14, 16] wherein majority of the farmers practised deworming occasionally. It was further reported that 11.00% of the respondents practised debudding and 89.00% did not practise debudding in their animals. The study further revealed that 82.00% of the respondents did nothing to control ectoparasites in animal house and 18.00% used traditional methods like smoke in animal house to control mosquitoes and spray of salt in animal house to prevent other ectoparasites. These findings were in agreement with that reported earlier [15]. High percentage among farmers was also reported controlling ectoparasites in Bareilly district of Uttar Pradesh [7]. In the present study, majority of the farmers were not aware about the harmful effects of ectoparasites which cause reduced animal production and performance through transmission of arthropod-borne diseases like trypanosomiasis, babesiosis and theileriosis [21]. It was further reported that 5.00% of the respondents practised traditional knowledge to treat animal's sickness, 51.00% got livestock inspector's help, 23.00% took the help of AI workers, and 21.00% reported veterinary officers treated their sick animals. The study further revealed that majority of the respondents reported non availability of veterinary services regularly as reported earlier [1].

3.4. Milking Management Practices

Hundred percent of the farmers practised hand washing and udder washing before milking for clean milk production (Table 1.). On the other hand, 79.00% of the respondents did not dry their hand before milking and used wet hand during milking which was major impediment in clean milk production. Only 21.00% of the respondents dried their hand before milking. The study further revealed that 10.00% of the respondents practised full hand milking, 3.00% stripping and 87.00% knuckling method to milk their animals.

Table 4. *Milking management practices.*

S.No.	Attributes	Category	No. of Respondents (n=100)
1.	Washing hand before milking	Yes	100.00
		No	0.00
2.	Udder washing before milking	Yes	100.00
		No	00.00
3.	Milking hand	Dry	21.00
		Wet	79.00
		Full hand	10.00
4.	Milking methods	Knuckling	87.00
		Stripping	03.00
5.	Teat dipping followed	Yes	01.00
		No	99.00
6.	Cleaning of milk utensils	Hot water	01.00
		Tap water	99.00
7.	Testing of mastitis	Yes	03.00
		No	97.00
		Dairy Co-operatives	61.00
8.	Milk disposal	Middle man	13.00
		Home consumption	26.00

When the respondents were asked whether teat dipping was followed, only one responded yes, 99.00% did not practise teat dipping due to ignorance and lack of knowledge about benefits of teat dipping. One respondent too followed teat dipping on the advice of veterinary personnel. The results further revealed that only one respondent cleaned his milk utensils with hot water and 99.00% of the respondents cleaned their utensils with tap water only. It was further

reported that only 3.00% of the respondents practised mastitis test and 97.00% never practised mastitis test. In the present study, very low level of clean milk production practices was observed which could be because of ignorance and lack of awareness about mastitis and clean milk production. Mastitis is a complex and multi factorial disease, the occurrence of which depends on variables related to the animal, environment and pathogen [24]. It is one of the most common, painful and costly diseases of dairy animals across the world [21]. Proper husbandry practices like regular cleaning of the animals, proper milking practices, milking of infected cows after apparently healthy animals, periodic/regular mastitis check up are needed to control and prevent mastitis causing bacteria [23]. The study further revealed that 61.00% of the respondents disposed their milk through dairy Co-operatives, 13.00% through middle man and 26.00% used their milk for home consumption.

4. Conclusion

It was concluded that indigenous cattle and buffaloes were important species of livestock in Narmada district of Gujarat which was lacking in proper health care practices like vaccination, deworming and treatment of livestock. The lack of scientific animal rearing causing poor animal production was the major impediment in good animal husbandry.

5. Recommendation

Necessary efforts should be made to bridge the gap between scientific practices of animal husbandry and the existing animal rearing practices in Narmada district of Gujarat.

References

[1] Sabapara, G. P., Desai, P. M., Singh, R. R. and Kharadi, V. B. (2012). Constraints of tribal dairy animal owners of South Gujarat. *Indian Journal of Animal Sciences* 82 (5):538-542.

[2] Prakash, N., Singh, S. B. and Kumar, R. (2011). Adoption of improved livestock technologies by the tribal farmers of North-eastern hill region of India. *Indian Journal of Animal Sciences* 81 (9):988-989.

[3] Kokate, K. D. and Tyagi, K. C. (1991). Dairy farming practices of tribal cattle owners. *Indian Journal of Extension Education* 27:70-75.

[4] Brar, P. S. and Nanda, A. S. (2004). Impact of conventional managemental practices on reproductive performance of rural buffaloes. *Indian Journal of Animal Reproduction* 25 (2):94-96.

[5] Chowdhary, N. R., Patel, J. B. and Bhakat, M. (2006). An overview of feeding, breeding and housing practices of dairy animals under milk co-operative system in Banaskantha district of North Gujarat region. *Dairy Planner* 5 (12):8-10.

[6] Patel, N. B., Patel, J. B., Prajapti, K. B. and Suthar, B. N. (2005). Breeding practices in dairy animals of rural area under Patan district of North Gujarat. *National Seminar on Recent advances in conservation of Biodiversity and augmentation of reproduction and production in farm animals.* Pp: 252. 5-7 March 2005. Sardar Krushinagar Dantiwada Agricultural University, Sardar Krushinagar.

[7] Sinha, R. R. K., Dutt, T., Singh, R. R., Singh, M. and Bhusan, B. (2010). Studies on breeding and health care management practices in rural, semi-urban and urban areas of Bareilly district of Uttar Pradesh. *Indian Journal of Animal Production and Management* 26 (1-2):11-15.

[8] Malik, B. S., Meena, B. S. and Rao, S. V. N. (2005). Study of existing dairy farming practices in Uttar Pradesh. *Journal of Dairying Foods & Home Science* 24 (2):91-95.

[9] Sabapara, G. P., Desai, P. M., Kharadi, V. B., Singh, R. R. (2010). Breeding and health care management status of dairy animals in the tribal area of South Gujarat. *Indian Journal of Animal Sciences* 80 (11):1148-1151.

[10] Gupta, D. C., Suresh, A. and Mann, J. S. (2008). Management practices and productivity status of cattle and buffaloes in Rajasthan. *Indian Journal of Animal Sciences* 78 (7):769-774.

[11] Jagdale, S. D., Patil, R. L., Atkare, V. G. and Deshmukh, A. B. (2000). Adoption of recommended feeding and management practices of buffalo by dairy farmers. *Indian Veterinary Journal* 77 (7):624-626.

[12] Rathore, R. S., Kachhwha, R. N. and Choudhary, V. K. (2009). Studies on existing management practices followed by the buffalo owners in Jhunjhunu district of Rajasthan. *National symposium on organic livestock farming-global issues, trends and challenges.* 26-28th February 2009. Kolkata. ISAPM. p. 33.

[13] Pawar, B. K., Nalawade, T. H. and Jagtap, D. Z. (2006). Adoption of bovine breeding practices and constraints faced by tribal farmers of Pune district. *Journal of Maharashtra agricultural University* 31 (3):329-330.

[14] Kalyankar, S. D., Chavan, C. D., Khedkar, C. D. and Kalyankar, S. P. (2008). Studies on management practices of buffaloes in different agro-climatic zones of Maharashtra. *Indian Journal of Animal Research* 42 (3):157-163.

[15] Yadav, C. M., Bhimawat, B. S. and Khan, P. M. (2009). Existing breeding and healthcare practices of cattle in tribals of Dungarpur district of Rajasthan. *Indian Research Journal of Extension Education* 9 (1):36-38.

[16] Mande, J. V. and Thombre, B. M. (2009). Adoption of cattle rearing practices by dairy cattle owners in Latur district. *Journal of Dairying, Foods & Home Sciences* 28 (3/4):176-180.

[17] Swanepoel, F., Stroebel, A. and Moyo, S. (2010). The role of livestock in developing communities: Enhancing multifunctionality. African Sun Media.

[18] Meena, M. S. and Chauhan, J. P. S. (1999). Awareness of improved dairy farming practices by farmers of Sawai Madhopur District. *Journal of Dairying, Foods & Home Sciences* 18 (1):58-60.

[19] Aulakh, G. S., Yadav, J. S. and Singh, R. (2011). Knowledge level of dairy farmers regarding recommended buffalo management practices. *Journal of Dairying, Foods & Home Sciences* 30 (2):147-149.

[20] Hegde, N. G. (2006). Livestock development for sustainable livelihood of small farmers. In Souvenir of the 39th Annual General Meeting and 48th National Symposium on "Energising Rural India – A Challenge to Livestock Industry. Compound Livestock Feed Manufacturers Association of India, Manesar, Haryana. August 26, pp. 50-63.

[21] Manimaran, A. and Kamboj, M. L. (2014). Health. In: National code of practice for management of dairy animals in India. ICAR- National Dairy Research Institute, Karnal. Pp:49-61.

[22] Kamboj, M. L. and Lathwal, S. S. (2014). Breeding. In: National code of practice for management of dairy animals in India. ICAR- National Dairy Research Institute, Karnal. Pp:5-8.

[23] Dereje, K., Kebede, A., Abebe, N. and Tamiru Y. (2018). Isolation, Identification and Antimicrobial Susceptibility Test of Mastitis Causing Bacteria at Holeta Agricultural Research Center Dairy Farms. *International Journal of Animal Science and Technology* 2 (1): 6-13.

[24] Radostits, O., Gay, C., Hinchcliffand, W. and Constable, D. (2007). Mastitis. In: Veterinary Medicine: A Text book of disease of cattle, sheep, pigs, goats, and horses 10th edition, Ballier, Tindall, London. Pp: 674-762.

[25] Hamid, S. A. and Kamruzzaman, S. M. (2017) Effects of GnRH on Conception Rate at the Time of Artificial Insemination in Crossbred Dairy Cows. *International Journal of Animal Science and Technology* 1 (1):19-34.

[26] Sarder, M. J. U. (2008). Occurrence of reproductive disorders in crossbred cows of north Bangladesh. Published in proceeding paper of 15th International Congress on Biotechnology and animal Reproduction, Bangladesh Agricultural University, Mymensingh, Bangladesh. Pp:74-75.