

*Original Research***Pregnancy Rate in Artificial Insemination Bred HF Crossbred Cattle Under Field Conditions of Eastern Uttar Pradesh State****R. L. Bhagat^{1*}, Brajesh Kumar², Bansh Narayan³, Raviraj Jadhav⁴, N. L. Phadke⁵ and A. B. Pande⁶**^{1,5 & 6} BAIF, Central Research Station, Uruli Kanchan, Pune- 412 202, Maharashtra, INDIA^{2,3 & 4} BISLD, North Zone, Uttar Pradesh, INDIA***Corresponding author:** ramchandra.bhagat@baif.org.in

Rec. Date:	Aug 09, 2019 06:22
Accept Date:	Oct 08, 2019 16:42
DOI	10.5455/ijlr.20190809062246

Abstract

The field progeny testing of Holstein Friesian crossbred bulls operated under National Dairy Plan (NDP) phase-I in Uttar Pradesh during February 2014 to March 2019 and total 1,43,065 AI's were performed on 80,244 animals out of that 1,25,612 AI's were followed till December 2018 for pregnancy confirmation. The data was classified according to districts, animal breed, animal age at AI, year of AI, season of AI, sequence of AI, lactation order of animal and sire used for AI. Logistic regression used to compute odds ratio and probability of pregnancy rate. Mean pregnancy rate was 47.47 ± 0.14 per cent and significantly higher in heifers ($49.22 \pm 0.24\%$), in animals from Gorakhpur district ($51.80 \pm 0.32\%$), animals age having below 30 months ($51.51 \pm 0.31\%$), animals inseminated in the year 2014 ($51.36 \pm 0.40\%$), in summer season ($52.09 \pm 0.26\%$), conceived in first attempt ($50.11 \pm 0.18\%$) and animals inseminated with HF75 per cent bulls semen ($48.22 \pm 0.16\%$) compared with respective groups of parameters under study.

Key words: Artificial Insemination, HF Crossbred Animals, Logistic Regression, Pregnancy Rate, Uttar Pradesh State**How to cite:** Bhagat, R., Kumar, B., Narayan, B., Jadhav, R., Phadke, N., & Pande, A. (2019). Pregnancy Rate in A.I. Bred HF Crossbred Cattle under Field Conditions of Eastern Uttar Pradesh State. International Journal of Livestock Research, 9(11), 145-152. doi: 10.5455/ijlr.20190809062246**Introduction**

Fertility of farm animals mainly depends upon genetic potential and environmental combination including nutrition, health and overall management adopted by farmers, and to assess the same per cent pregnancy rate is the accepted indicator. Increased age at first calving, service period, calving interval which ultimately results into lowering, overall lifetime productivity of animals is repercussion of low pregnancy rate either due to non-expression of heat, reproductive problems or increased number of services per pregnancy. Lower heritability of the trait is indicative of greater environment and management influence suggesting scope for improvement in management of animals by farmers. Available literature on relation of animal breed, season of artificial

insemination (AI), sire used for AI, animal lactation order, animal age at the time of AI and sequence of AI etc. with pregnancy of animals is inadequate to explain the role of these factors for deciding fertility strategy at village level. An attempt in the present investigation was made to study these factors affecting pregnancy rate as an indicator of fertility in animals under field conditions of Uttar Pradesh state.

Materials and Methods

The field progeny testing of Holstein Friesian crossbred bulls operated under National Dairy Plan (NDP) phase-I in Uttar Pradesh during February 2014 to March 2019 and coordinated through National Dairy Development Board (NDDB) Anand, Gujarat, in India. BAIF, Pune contributed the bulls for test inseminations. Total 1,43,065 AI's were performed on 80,244 animals during the period of five years and out of that 1,25,612 AI's were followed till December 2018 for pregnancy confirmation and this forms data for present investigation. These animals were maintained by 55,416 farmers spread over jurisdiction of 100 cattle development centres distributed in five districts namely Azamgarh, Gorakhpur, Jaunpur, Pratapgarh and Sultanpur of Eastern Uttar Pradesh state. All animals were maintained and reared by the farmers' individually. The housing ranged from open to permanent constructed sheds. Animals were stall fed with dry and green fodder along with concentrate. The calls for artificial insemination received through mobile phones and animals were inseminated with frozen semen at doorstep of farmers. Cows not repeated within 60 to 70 days post insemination were examined for pregnancy confirmation by rectal palpation. The pregnancy rate calculated by formula as suggested Qureshi *et al.* (2008)

The information on districts (Azamgarh, Gorakhpur, Jaunpur, Pratapgarh Sultanpur), animal breed (HF cross of Gir, ND, Sahiwal), animal age at the time of AI (below 30, 31 to 42, 43 to 55, above 55 months), year of AI (2014, 2015, 2016, 2017, 2018), season of AI (Rainy-June to September, Winter-October to January, Summer-February to May), sequence of AI (1st, 2nd, 3rd, 4th& above) lactation order of animal (heifer, first, second, third, fourth, fifth & above), and sire used for AI (HF50%, HF75%) was compiled for studying effect on pregnancy rate.

Logistic Regression

Generally identifying genetic and non-genetic factors influencing various functional traits in dairy animals' is difficult using conventional analysis wherein the normality of residual error assumed. Under such conditions of binary or discontinuous nature of response, variable, logistic regression can facilitate effectively in exploring the relationship between the dependent and independent variables. Logistic regressions work with odds rather than proportions. The odds are simply the ratio of the proportions for the two possible mutually exclusive outcomes. If p is the proportion for one outcome, then (1-p) is the proportion for the second mutually exclusive outcome-

$$\text{ODDS} = p/(1-p)$$



The logistic regression model relates the log of the odds to the explanatory variable in the form of a linear function. In case of multiple logistic regression, more than one continuous/discrete explanatory variable can be incorporated in the model to study their simultaneous effect on the categorical response variable. The Akaike Information Criterion (AIC) was used to assess the fitness of the model (Manoj *et al.*, 2015). The data was analyzed using R project for statistical computing software (version 3.6.1).

Results and Discussion

The overall mean pregnancy rate was recorded as 47.47 ± 0.14 per cent which was remarkably higher than finding of Anzar *et al.* (2003) in Pakistan (29.00%), Nordin *et al.* (2004) in Malaysia (35.50%), Bhagat *et al.* (2008 & 2009) in field crossbred cattle (45.16 ± 0.46 & $43.58 \pm 0.40\%$) in Maharashtra state, however lower to that of reported by Woldu *et al.* (2011) in Ethiopian cattle (48.30%), Shindey *et al.* (2014) in animals from Wardha district of Maharashtra state ($46.40 \pm 0.19\%$), Razi *et al.* (2010) in Bangladeshi cattle, Gokhale and Bhagat (2015) and Bansal *et al.* (2019) under field conditions of Maharashtra ($55.96 \pm 0.31\%$) and Bihar state (52.16%), respectively.

District

District significantly affected the pregnancy rate of animals (Table 1). The reports of Bansal *et al.* (2019) supported the present findings however, Pandey *et al.* (2016) reported non-significant effect of districts on pregnancy rate under Jharkhand state conditions.

Table 1: District affecting pregnancy rate in HF crossbred cattle with multivariate regression model

District**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
Azamgarh	19099	15.2	49.65	0.36	1	0.5	49.65
Gorakhpur	25004	19.91	51.8	0.32	1.09	0.52	51.73
Jaunpur	19232	15.31	51.78	0.36	1.06	0.51	51.06
Pratapgarh	18373	14.63	49.12	0.37	0.97	0.49	48.82
Sultanpur	43904	34.95	41.49	0.24	0.74	0.42	42.12

** ($p < 0.01$)

Highest per centage of animals covered (34.95%) under AI's were recorded from Sultanpur district followed by Gorakhpur district (19.91%) and lowest from Pratapgarh district (14.63%). The coverage of AI from Azamgarh and Jaunpur districts was at par (15.20 & 15.31%, resp.). The AI coverage and pregnancy rate found to be negatively correlated. The probability of getting highest animals pregnant was noticed at par in Gorakhpur and Jaunpur districts (51.80 ± 0.32 & $51.78 \pm 0.36\%$) as well as Azamgarh and Pratapgarh districts (49.65 ± 0.36 & $49.12 \pm 0.37\%$) and lowest from Sultanpur district ($41.49 \pm 0.24\%$). These results were in agreement with the findings of Bansal *et al.* (2019) under Bihar state field conditions. The individual farmers' management and

agro-climatic conditions of respective district might be attributed to the significant differences in pregnancy rate of animals.

Animal Breed

Although 95.58% portion of cattle population was comprised of HF Non-Descript (ND) crossbred, HF Gir and HF Sahiwal crosses (0.83 & 3.59%, respectively) also recorded under study (Table 2). The pregnancy rate among breeds non-significantly differed, which disagree with the results of Miah *et al.* (2004) in Bangladeshi crossbred cows and Bansal *et al.* (2019) in Bihar state field animals noticed significant effect of animal breed on conception rate. Highest chances of getting pregnancies was noticed in HF Sahiwal cross animals (49.79±0.75%) followed by HF ND cross (47.40±0.14%) and lowest in HF Gir cross (46.11±1.55%) animals. Similar findings of significant higher pregnancy rate in local animals and ND crosses were also reported by Bhagat *et al.* (2009), Anzar *et al.* (2003), Razi *et al.* (2010), Pandey *et al.* (2016), Potdar *et al.* (2016) and Bansal *et al.* (2019) in field animals, however Qureshi *et al.* (2008) reported higher pregnancy rate in Holstein crosses in Jammu region.

Table 2: Animal breed affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Animal Breed (NS)	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
HF Gir	1041	0.83	46.11	1.55	1	0.5	46.11
HF ND	120066	95.58	47.4	0.14	1.09	0.52	48.14
HF Sahiwal	4505	3.59	49.79	0.75	1.13	0.53	48.87

NS-Non-Significant

Age at AI (Months)

With the advancement of animal's age the pregnancy rate goes down is established fact and this proved in this Uttar Pradesh state field conditions. With advancement of animal age, the pregnancy rate significantly reduced from 51.51±0.31 per cent for animals having age below 30 months at the time AI to 46.13±0.21 per cent for animals having age more than 55 months (Table 3).

Table 3: Age at AI affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Age at AI (months)**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated pregnancy rate%
Below 30	26473	21.08	51.51	0.31	1	0.5	51.51
31 to 42	23394	18.62	47.02	0.33	0.89	0.47	48.44
43 to 55	21513	17.13	46.39	0.34	0.89	0.47	48.56
Above 55	54232	43.17	46.13	0.21	0.94	0.48	49.96

** ($p < 0.01$)

This might be because of in old age animals' feed and fodder intake reduces, digestion affects and ultimately hormonal changes leads to un-time heat, weak heat symptoms, delayed ovulation, unnoticed pre-mature abortions etc. which results into increased number of AI's and servicer period.

Year of AI

The scientist Gwazdauskas (1985) reported that extremes in climate could affect deleteriously reproduction in animals. Seasonal variation of environment, nutrition, and management alters estrous activity and duration of estrus. Conception rates are reduced under stress of heat and cold. Endocrine functions altered by climatic extremes. In present investigation pregnancy rate noticed to be significantly reduced from 51.36±0.40 per cent in the year 2014 to 43.23±0.28 per cent in the year 2018, but coverage of AI increased almost double (12.69 to 24.14%) during the period of five years from 2014 to 2018 (Table 4).

Table 4: Year of AI affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Year of AI**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
2014	15941	12.69	51.36	0.4	1	0.5	51.36
2015	27064	21.55	50.79	0.3	0.88	0.47	48.22
2016	23817	18.96	48.07	0.32	0.83	0.45	46.66
2017	28465	22.66	46.17	0.3	0.78	0.44	45.08
2018	30325	24.14	43.23	0.28	0.7	0.41	42.42

** ($p < 0.01$)

Season of AI

From Table 5, it was revealed that the distribution of per cent inseminations performed was 39.43% in rainy season and during summer and winter, AI's were similar (30.32 & 30.24%).

Table 5: Season of AI affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Season of AI**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
Rainy	49534	39.43	44.71	0.22	1	0.5	44.71
Winter	37987	30.24	46.44	0.26	1.14	0.53	47.71
Summer	38091	30.32	52.09	0.26	1.42	0.59	52.52

** ($p < 0.01$)

Bansal *et al.* (2019) recorded maximum AI in summer (34.96%) season compared with rainy (34.85%) and winter season (30.19%). Significantly higher pregnancies were recorded in summer season (52.09±0.26%) followed by winter season (46.44±0.26%) and rainy season (44.71±0.22%) these results were resembled with the findings of Shindey *et al.* (2014), Pandey *et al.* (2016) and Potdar *et al.* (2016) who noticed that animals inseminated during summer season had higher pregnancy rate. However, Bhagat and Gokhale

(2013, 2016) and Bansal *et al.* (2019) reported higher pregnancies in winter season. Higher pregnancies in summer season might be attributed to spill over better effect of winter season on overall animal health.

Sequence of AI

The endeavors to get the animal conceived in minimum AI is beneficial in many folds to farmer like, it saves expenditure incurred on breeding, reduces age at first calving, service period, inter-calving period of animals as well as increases overall productive life of animals. In present study from Table 6, it was seen that almost two third inseminations (63.27%) were performed in first attempt followed by second (22.36%), third (7.91%) and very few in fourth and above attempt (6.48%). The pregnancies recorded in first attempt were significantly highest (50.11±0.18%) compared to inseminations performed in second (47.60±0.30%), third (40.60±0.49%) and forth and more attempts (29.64±0.51%). The results obtained in present investigation corroborated with the findings of Shindey *et al.* (2014) and Bhagat and Gokhale (2016) who recorded significantly highest conception rate in first attempt in field animals at Maharashtra state conditions.

Table 6: Sequence of AI affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Sequence of AI**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
1 st	79479	63.27	50.11	0.18	1	0.5	50.11
2 nd	28085	22.36	47.6	0.3	0.93	0.48	48.3
3 rd	9940	7.91	40.6	0.49	0.72	0.42	42.03
4 th & more	8108	6.45	29.64	0.51	0.46	0.32	31.77

** ($p < 0.01$)

Lactation Order

Animal lactation order significantly affected pregnancy rate (Table 7). Shindey *et al.* (2014), Bhagat and Gokhale (2016), Potdar *et al.* (2016) and Bansal *et al.* (2019) also recorded similar results, however, Bhagat and Gokhale (2013) and Pandey *et al.* (2016) recorded non-significant effect of parity on pregnancy rate. Highest pregnancy rate was observed in heifers (49.22±0.24%) compared with multiparous animals, which agree with the results of Potdar *et al.* (2016) whereas, the findings of Gunasekaran *et al.* (2008), Razi *et al.* (2010), Bhagat and Gokhale (2016), Pandey *et al.* (2016) and Bansal *et al.* (2019) differed the present investigation as they noticed lowest pregnancy rate in heifers. The higher pregnancy in heifers might be due more attention of farmers to young stock being a future generation to reap maximum returns. Bansal *et al.* (2019) in their study reported that in multiparous animals, the likelihood of getting pregnancies increased with progress of lactation order and reached highest in third lactation (52.93%) and decreased thereafter however, in present investigation, no such trend noticed but highest pregnancies were recorded in animals having second (47.27±0.31%) and fourth lactation (47.19%) compared with other lactation animals.

Table 7: Lactation order affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Lactation order**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
Heifer	42684	33.98	49.22	0.24	1	0.5	49.22
First	30631	24.39	46	0.29	0.94	0.48	47.63
Second	26285	20.93	47.27	0.31	0.96	0.49	48.2
Third	16364	13.03	46.57	0.39	0.94	0.48	47.71
Fourth	6324	5.03	47.19	0.63	1	0.5	49.3
Fifth & more	3324	2.65	45.22	0.86	0.96	0.49	48.12

** ($p < 0.01$)

Breed of Bull

Bull (whose semen used for AI) breed had significant influence on pregnancy rate (Table 8). Present results supported the findings of Bhagat and Gokhale (2016), Pandey *et al.* (2016), Potdar *et al.* (2016) and Bansal *et al.* (2019), however, Miah *et al.* (2004) reported that genotype of bulls used for AI did not affect the pregnancy rate. Being a HF crossbred progeny testing program use of HF crossbred bulls semen was mandatory and the results indicated that more than three fourth inseminations (83.02%) were performed by using HF75% bulls semen, while remaining 16.98% AI's done by using HF50% bulls semen. The probability of attaining highest pregnancy rate (45.11%) was recorded in animals inseminated with HF75% bulls' semen.

Table 8: Breed of bull affecting pregnancy rate in HF crossbred cattle with multivariate regression model

Breed of bull**	N	% Coverage	Means	Std. error	Odds ratio	Relative Probability	Estimated Pregnancy Rate%
HF 50	21325	16.98	43.81	0.34	1	0.5	43.81
HF 75	104287	83.02	48.22	0.16	1.06	0.51	45.11

** ($p < 0.01$)

Conclusion

The study indicated that pregnancy rate significantly affected due to district, animal age at AI, year, season and sequence of AI, lactation order of animal and breed of bull used for inseminating the field animals. These factors need to be emphasized for having better pregnancy in AI bred cattle under Uttar Pradesh field conditions.

Acknowledgment

The financial assistance provided by National Dairy Plan phase-I, through National Dairy Development Board (NDDDB), Anand is gratefully acknowledged. The authors are indebted to president of BAIF, for his inspiration and ceaseless support to undertake the research work.

References

1. Anzar M, Farooq U, Mirza M A, Shahab M and Ahmad N. 2003. Factors affecting the efficiency of artificial insemination in cattle and buffalo in Punjab Pakistan. *Pakistan Veterinary Journal*, 23 (3):106-13.
2. Bansal S K, Bhagat R L, Sinha A K, Yadav A L and Phadke N L 2019. Factors affecting conception rate in AI bred cattle under field conditions of Bihar state. *Indian Journal of Animal Sciences*. 89 (1):110-112.
3. Bhagat R L and Gokhale S B. 2013. Factors affecting conception rate in crossbred cattle under field conditions. *International journal of Tropical Agriculture* 1 (3-4):249-52.
4. Bhagat R L and Gokhale S B. 2016. Studies on factors influencing conception rate in rural cattle. *Indian Journal of Animal Sciences* 86 (5):550-52.
5. Bhagat R L, Gokhale S B, Gokhale R B, Pande A B and Karbade V G. 2009. Reproduction attributes affecting conception rate in crossbred cattle. *International journal of Tropical Agriculture* 27 (1-2):169-72.
6. Bhagat R L, Gokhale S B, Pande A B and Phadke N L. 2008. Socio-economic factors influencing conception rate in cattle under field conditions. *Indian Veterinary Journal* 85:416-18.
7. Gokhale S B and Bhagat R L. 2015. Inseminator attributes affecting conception rate in crossbred cattle. *International Journal of Tropical Agriculture*. 33 (3):2373-76.
8. Gunasekaran M, Singh Chanran and Gupta A K. 2008. Effect of estrus behavior on fertility in crossbred cattle. *Indian Vet. Journal* 85:159-63.
9. Gwazdauskas F C 1985. Effects of climate on reproduction in cattle. *J. Dairy Sci.* 68: 1568-1578
10. Manoj M, Gupta A K, Mohanty T K, Muhammad Aslam M K, Chakravarty A K, Singh A, Malhotra R and Gandhi R S. 2015. Non-genetic factors influencing fertility problems in Murrah buffaloes. *Indian Journal of Animal Sciences* 85 (5):485-88.
11. Miah Abdul Gaffar, Salma Ummay and Hossain M M. 2004. Factors influencing conception rate of local and crossbred cows in Bangladesh. *International Journal of Agriculture and Biology* 6 (5):797-01.
12. Nordin Y, Zaini N and Wan Zahari W M. 2004. Factors affecting conception rate in dairy cows under selected smallholder production system. *Journal of Tropical Agriculture* 32 (2): 219-27.
13. Pandey A K, Singh M P, Bansal S K, Gokhale S B. 2016. Response of rural cattle to artificial insemination in Jharkhand. *Indian J Dairy Sci.* 69 (5): 600-04.
14. Potdar Vinod V, Bhave Kaustubh, Gaundare Yuvraj, Awasthi Hitesh R and Khadse Jayant R. 2016. Factors influencing conception rate of local and crossbred cows. *IOSR Journal of Agriculture and Veterinary Science*. 9 (10):51-54.
15. Qureshi Akhtar M, Kahlid Javed, Jarral Z A and Khan S A. 2008. Environmental factors affecting performance traits of crossbred and local dairy cows at Mirpur Azad Jammu and Kashmir. *Pakistan Journal Agri Science*. 45 (2):362-71.
16. Razi K M A, Asgar M A, Kabir M H, Bag M A S and Parvez, M. M. 2010. A study on estimation of conception rate and services per conception in cattle after artificial insemination. *Int. J. Bio. Res.* 2 (7):25-29.
17. Shindey D N, Dhanvijay R W, Bhagat R L and Gokhale S B. 2014. A note on conception rate in animals of Wardha district in Vidharbha region of Maharashtra State. *International Journal of Tropical Agriculture*. 32 (3-4):595-99.
18. Woldu T, Giorgis Y T, Haile A. 2011. Factors affecting conception rate in artificially inseminated cattle under farmers' condition in Ethiopia. *Journal of Cell and Animal Biology*. 5 (16):334-38.