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Present status and future prospects of Gir cow

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The diversity of animal genetic resources is essential to meet the basic human needs for food and livelihood. The Gir cattle in Saurashtra provide milk, manure and draught power. Animal genetic resources of native breeds are largely underutilized in India and indiscriminate cross breeding has degraded local breeds in large number. This is also true with Gir cattle in its native breeding tract. Today, most production systems worldwide depend on native livestock breeds domesticated in the respective region. There are many important requirements and challenges for the livestock sector in the region. The key areas of importance include livestock system intensification that is to intensify animal husbandry system in the region focused on dairy husbandry.

Although it is a well established fact that animal husbandry provides livestock associated livelihood and employment to economically weaker communities and households, still the enterprise has not reached in the rural households of most areas of the country. Gir cattle rearing in the region has been a traditional occupation of most of the communities like Madharis, Ahir and Mer etc. This is also directly associated with the rural economy. India with 190.9 million cattle has 14.7% of world cattle population (Anonymous 2013); of this 83% i.e. 166 million are indigenous. Most of the indigenous cattle are non-descript and only 20% belong to recognized breeds (Anonymous 2014). All most all the Indigenous cattle in India including Gir are robust and resilient and are particularly suited to the climate and environment of their respective breeding tract or natural habitat. Heat tolerance and disease resistance are the important qualities of genetic origin inherited by indigenous livestock. Their ability to perform under extreme stress and sub-optimal nutrition, make them most ideal and suitable to prevailing native conditions. Thus, effects of global warming are likely to be minimal in Indigenous breeds cattle.

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Physical and morphological characteristics: Gir are generally mottled with the colour ranging from red to white. Most of the cattle have shinning and short hair. Forehead is prominent, convex and broad like a bony shield. This overhangs eyes in such a way that they appear to be partially closed and the animal shows sleepy appearance. Ears are long and pendulous and folded like a leaf with a notch at the tip. Horns are curved turning back at the tip. Gir animals have moderately developed dewlap: males have a large and pendulous sheath. The tail is long and whip like; hooves are black and medium-sized; skin is loose and pliable; hipbones are prominent; the body is well proportionate; the udder in cows is well developed and predominantly round udder is mostly observed.

District-wise bovine population: The breed derives its name from the Gir forest, which is the natural habitat of the breed. Gir is a famous milch cattle breed of India. The native tract of the breed is Gir hills and forests of Kathiawar including Junagadh, Gir-Somnath, Amreli, Bhavnagar, Rajkot, Porbandar, Morbi districts and some parts of Surendranagar district of Gujarat. This breed is also popularly known as *Kathiawari* and *Sorthi* in different parts of the breeding tract. The Gir cattle are well known for their tolerance to stress conditions and resistance to various tropical diseases.

These animals contribute significantly to the total milk production of Gujarat state. Bullocks of this breed are powerful and are used to drag heavy loads on all kinds of soil. Brazil, Mexico, USA and Venezuela have imported

Table 1. District-wise livestock population of Saurashtra (000 NOS.)

District	Cattle	Buffalo
Jamnagar	350	257
Rajkot	452	362
Surendranagar	347	290
Bhavnagar	340	334
Amreli	269	201
Junagadh	481	377
Porbandar	83	105
Total	2,322	1,926

(Anonymous 2012–13).

Fig. 1. Adult Gir cow.

these animals where they are being bred successfully. The Gir was introduced into the United States as early as 1849. In USA, Brahman breeds, which have been developed from Indian cattle breeds and their germplasm, are the basis of a flourishing meat industry (Beef Cattle Breeds: Farmers Bulletin No. 2228,1968). In Latin America, several breeds have been developed from Indian cattle breeds like Gir and Ongole. The first Indian cattle landed on Brazilian shores in 1906 and it is ironical that, while the finest Indian zebu specimens can be seen all over Brazil but in their native country, India, they are very rarely to be found and are mostly confined to Government institutional farms. Livestock population (18th census 2007) of Saurashtra region is given in Table 1. District-wise population indicated that there are about 23.22 lakh cattle available in the Saurashtra region.

Assuming that entire cattle population of Saurashtra is of indigenous origin, the fact is that (i) only two-third population is either graded Gir or Gir like and hence not pure Gir, (ii) only 1/3 population i.e. 7.6 lakh could be 95% pure Gir. Hence, it is difficult to obtain large number of pure Gir animals. Growth rate in indigenous cattle population over the year 2003 is only 3.62 %. (Anonymous 2012–13)

Milk production of Indigenous cattle in the region: District wise milk production and trend of change in the same in Saurashtra region is given in Table 2. The above milk production record does not include milk production from crossbred population. Since 2003–04 to 2012–13, contribution of Saurashtra to state total indigenous cattle milk yield is 60%. In Gujarat, total milk production only from indigenous cattle is 2.17 million tonnes.

Production performance of Gir cattle: Production and reproduction performance of Gir cattle as cited from literature is detailed in Table 3. A study on survey of production performance of Gir cows in districts Junagadh, Rajkot and Bhavnagar, revealed that, average test day milk yield in Gir cows over a lactation were 7.99±0.05 litre/d for Junagadh, 6.43±0.03 litre/d for Rajkot and 6.71±0.04 litre/d for Bhavnagar district. The projected values for 300-days milk yield was 2397, 1929, and 2013 litre for the 3 districts, respectively (Gardharia *et al.* 2000). Similarly, milk fat content was observed as 4.65, 4.60 and 4.55% in Junagadh, Rajkot, and Bhavnagar districts, respectively. For Gir cattle, average milk production per lactation as 1,225 to 2,268 kg with a maximum of 3,175 kg, average lactation length as 240–380 days and average fat % as 4.5 to 4.6 % were documented by Williamson and Payne (1987). Taneja (1999) reported the average milk production of Gir as 1,126 kg to 1,859 kg and lactation length as 230 to 394 days. Dutta *et al.* (2007), in his study of 25 years data on Gir cows at CBF reported average lactation yield as 2,029 litre in 321 days lactation length and 1843.8 litre milk yield in 300 days. Vataliya *et al.* (2013) reported average lactation yield in Gir cows at CBF as 2002.6 litre in an average lactation period of 354 days. He also reported 300d LY as 1748.6 litre. Dangar and Vataliya (2015) similarly reported average milk yield as 2,276±171.32 kg, in Gir herd of Junagadh. The lactation yield of Gir cows maintained at cattle breeding farm Junagadh was evaluated and reported in 1986 and 1987 as given in the Table 4 below:

Age at first calving and other reproduction traits: Age at first calving in Gir ranged from 43.3 months to 61.5

Table 2. Milk production of indigenous cattle in Saurashtra (000 MT)

District	1992–93	97–98	03–04	07–08	08–09	09–10	10–11	11–12	12–13
Amreli	61	64	77	79	82	85	90	95	111
Bhavnagar	68	107	102	122	125	130	134	134	140
Jamnagar	59	66	79	96	98	101	100	97	104
Junagadh	105	112	108	129	139	147	151	169	181
Porbandar	–	–	22	26	24	27	25	30	30
Rajkot	88	113	122	140	139	143	134	135	144
Surendranagar	64	79	92	111	117	128	140	151	161
Total	445	541	602	703	724	761	774	811	871
Gujarat	995	1291	1633	1849	1851	1912	1978	2059	2177
% Contribution of Saurashtra	55.2	58.1	63.1	61.9	60.9	60.2	60.8	60.6	60.0

Table 3. Production and reproduction performance of Gir cattle as cited from literature

Population herd	LY(l)	300 LY (l)	LL (days)	AFC (month)	Age at 1st service (month)	CI (month)	DP (days)	SP (days)	Reference
CBF, Junagadh	1862.5		334			483			Gajbhiye *et al.* (1987)
CBF, Junagadh	(I) 1904.7		326			478			Gajbhiye and
	(II) 1807.0		287			448			Dhanda (1987)
	(III) 1834.1		288			425			
-	1126 to1859		230 to394			426 to541			Taneja(1999)
Districts									
Junagadh	2397	7.99		44	33.5	395.3		99	Gardharia *et al.*
Rajkot	1929	6.43		45	34.0	409.8		119	(2000)
Bhavnagar	2013	6.71		49	35.5	422.3		140	
				46	34.3	409		116	
CBF, Junagadh (25 years data)	2029	1843	321	52	41.5	460.6	179	180	Tajane *et al.* (1998) Dutta *et al.(* 2007)
CBF (Junagadh)	1838 1225 to 2268	1637	337days 240 to 380	52.3	31 to 51	14 to 16			Vataliya *et al.* (2013) Williamson and Payne (1987)
CBFJunagadh	2063		326		1149		123	141	Gaur *et al.,* (2003)
Kasturba Gram Dairy From Indore						400			Singh *et al.* (2012)
CBF (Junagadh)	2006±48	1819± 45 days	281±4.5 days	1527±14 days		481±4.8 Days (15.8mths)			Gadariya *et al.* (2013)
				1346± 26 days				274±21 days	Umrikar *et al. (1*990)
						461 days		1174 days	Ulmek and Patel (1995)
				1707±19 days					Barwe *et al. (1*996)
				1490.50±11.40 days					Dangar and Vataliya (2014)

months (Taneja 1999). AFC as reported by Dutta *et al.* (2007) averaged 52 months in Gir cows at CBF similar close average were reported by Vataliya *et al.* (2013). Gadariya *et al*. (2013) observed average AFC in Gir cattle as 1527.7±14.1 days. Survey report of Junagadh, Rajkot and Bhavnagar districts indicates AFC in field Gir cows as 45, 49, and 46 months, respectively, for the three districts (Gardharia *et al.* 2000).Very few information on calving interval, service period, dry period in Gir cattle is available in literature. Calving interval ranged from 409 days to 541 days (Anonymous1998–2000, Taneja 1999). Calving internal of 481±4.8 days (Gadariya *et al.* 2013), services period of 116 days to 180 days and dry period of 179 days (Dutta *et al.* 2007) in Gir have been reported.

According to the annual progress report of Cattle breeding farm, Junagadh for the year 2001 to 2013 (13 years), the production performance of Gir cows was as follow:

Analysis of performance of Gir cows at CBF, Junagadh: Data on 1,744 lactation records of Gir cattle maintained at cattle breeding farm, Junagadh for the period of 35 years, from the year 1965 to 2010 was analysed using least squares analysis (Harvey 1987). The data consists of parity 01 to 10 and was classified in four seasons and ten periods.

Lactation yield: Parity has a significant effect (P<0.01) on total lactation milk yield in Gir cows at CBF. Highest total lactation yield (LY) was observed in 2nd lactation (2132±123.4 ltr) while lowest was observed in 10th lactation (1456.8±219.1 ltr). Thus, as the parity advances the average LY decreases. Average Total Lactation Yield (TLY) for the cows calved during period (2005–2010) was observed to

Table 4. Lactation performance of Gir at CBF (2001–2013)

Lactation	Milk Yield (l)	LL (days)	Source
All Lact	1862.5	334	Gajbhiye *et al. (1*987)
1st Lact	1904.7	326	Gajbhiye and Dhandha (1987)
2nd Lact	1807.0	287	Gajbhiye and Dhandha (1987)
3rd Lact.	1834.1	288	Gajbhiye and Dhandha (1987)

be maximum (2490.7±162.9). At the same time, lowest average LY was observed in the cows calved during the period 1(1965–70). Period under which the animal performed also has significant effect (P<0.01) on TLY. Hence a steady improvement in LY was seen over the period. No significant difference among cows calved in difference season of the year was observed for lactation yield.

300-d lactation yield: Gir cows in 4th parity expressed maximum 300-d LY (1823.4 ± 100.9 litre) while minimum average LY300 was observed in 10th lactation (1355.89 l). Period-wise distribution of LY 300 shows that average 300-day yield was found maximum in cows those calved in years 2001 to 2010, while those calved during 1986–90 exhibited lowest LY300 (1823.4±100.9 l). Influence of calving season was non-significant on LY300.

Table 5. Performance of Gir at CBF (2001–2013)

Performance trait	Range
Total Lact. yield ranged	1760 – 2549 L
300d yield ranged	1509 – 2247 L
Lact. length ranged	299 – 365 days
Dry days	96 – 165 days
Calving interval	408 – 503 days
Wet average	5.3– 7.7 L/days
Her average	2.5 – 4.68 L/days
AFC	47 – 56 Month

Table 6. Parity-wise calving interval, lactation period, total lactation milk yield (TLMY) and standard lactation milk yield (SLMY) in Gir cows (Gadariya *et al.* 2013)

Parity	Calving interval, days		Lactation days		TLMY , l	SLMY, l
	N	Mean ± SE	N	Mean ± SE	Mean ± SE	Mean ± SE
1	226	492.96±9.13	316	247.28 ±9.02	1699.24 ± 69.40	1427.49 ± 51.36
2	194	481.91 ±10.42	262	293.18 ±10.93	1910.03 ± 72.20	1697.90 ± 57.68
3	127	470.35 ±12.32	169	319.12 ±11.20	1993.17 ± 81.21	1870.52 ± 69.46
4	92	476.03 ±14.67	82	252.33 ±11.99	2418.01 ± 300.04	2207.12 ± 302.35
5	67	481.61 ±16.29	112	333.59 ±13.00	2423.65 ± 106.34	2303.05± 87.24
6	50	505.22 ±22.96	64	237.92 ±16.74	2361.67 ± 129.54	2111.11 ± 109.07
7	35	485.74 ±27.04	90	335.69 ±15.11	2275.21 ± 168.59	2029.04 ± 129.72
8	27	449.93 ±23.82	48	230.58 ±21.87	2134.59 ± 160.03	1951.89 ± 139.47
9	12	429.75 ±25.26	66	335.11 ±21.98	1354.29 ± 192.63	1294.81 ± 179.78
>9	9	386.56 ±7.07	154	280.69 ±12.11	1862.00 ± 37.89	1689.97 ± 357.38
Over-all	839	481.22 ±4.86	1363	281.02 ±4.56	2006.29 ± 48.77	1819.73 ± 45.44

Month	Season	Number
July, Aug, Sep	Rainy	341
Oct, Nov, Dec	Winter	545
Jan, Feb, Mar	Spring	534
April, May, June	Summer	324

Period

Period	N
1965 – 1970	158
1971 – 1975	256
1976 – 1980	310
1981 – 1985	82
1986 – 1990	19
1991 – 1995	243
1996 – 2000	172
2001 – 2005	260
2006 – 2010	219
> 2010	25

Least squares means

	Mean	SD
Lact. yield (l)	2054.9	854.7
300 d MY (l)	1759.1	760.0
Lact. length (days)	325.5	105.0

Table 7. Mean ± SEs for parity-wise, period-wise and season-wise 300 d MY, lactation length and lactation yield in Gir cattle at CBF

Parity	N	300 d MY	Lactation yield	Lactation days
1.	377	1681.95 ± 102.85	2104.92 ± 125.80	**366.00 ± 12.05**
2.	362	1652.32 ± 100.65	**2132.05 ± 123.44**	331.46 ± 11.67
3.	294	1812.51 ± 100.16	2087.00 ± 122.92	312.86 ± 11.59
4.	243	**1823.40 ± 100.98**	2032.83 ± 123.79	307.13 ± 11.73
5.	175	1814.89 ± 103.84	2001.41 ± 126.86	297.86 ± 12.22
6.	120	1694.47 ± 109.56	1846.92 ± 133.01	291.64 ± 13.20
7.	75	1594.05 ± 119.60	1796.08 ± 143.89	289.92 ± 14.86
8.	50	1486.95 ± 134.67	1487.89 ± 160.39	275.93 ± 17.27
9.	29	1377.61 ± 158.49	1430.54 ± 186.74	251.09 ± 20.97
10.	19	1355.89 ± 187.45	1456.80 ± 219.09	280.65 ± 25.35
Period				
1965 – 1970	158	1394.87 ± 156.54	1401.54 ± 184.58	326.83 ± 20.67
1971 – 1975	256	1530.76 ± 141.35	1695.58 ± 167.75	298.77 ± 18.32
1976 – 1980	310	1596.93 ± 146.73	1695.25 ± 173.69	310.02 ± 19.16
1981 – 1985	82	1598.42 ± 172.63	1736.60 ± 202.50	307.79 ± 23.12
1986 – 1990	19	1334.70 ± 202.09	1478.89 ± 235.52	278.00 ± 27.53
1991 – 1995	243	1491.25 ± 133.74	1658.23 ± 159.37	284.97 ± 17.12
1996 – 2000	172	1630.44 ± 126.67	1772.87 ± 151.62	280.66 ± 16.00
2001 – 2005	260	**2019.34 ± 123.92**	2284.26 ± 148.61	304.71 ± 15.56
2006 – 2010	219	1996.72 ± 136.98	**2490.71 ± 162.93**	**340.41 ± 17.64**
> 2010	25	1700.61 ± 206.17	2162.50 ± 240.11	272.41 ± 28.14
Months				
July, Aug, Sep	341	1611.19 ± 99.57	1811.08 ± 122.29	299.0 ± 11.48
Oct, Nov, Dec	545	**1660.09 ± 96.37**	**1875.79 ± 118.88**	295.05 ± 10.91
Jan, Feb, Mar	534	1643.44 ± 96.44	1860.35 ± 118.96	301.42 ± 10.93
April, May, June	324	1602.89 ± 99.20	1803.35 ± 121.89	**306.32 ± 11.42**

Lactation length: The first calver Gir cows yielded for average 366 ± 12 days LL being highest in first calver while cows in 9th parity yielded for 251 ± 20.9 days. Period wise distribution indicates that cows calved during 2006 to 2010 had lactation period of 340± 7.6 days which was maximum, while those calved during Yr. 2010 and onwards had minimum LL of 272.4±28.1 days. Influence of season was not found to be significant hence calving season had no role in determine the lactation period in Gir Cattle.

Heritability estimates and suggestions: Heritability for the traits LY, 300 d LY and LL estimated using intra-class correlation among the half sibs were 0.133±0.023, 0.114± 0.021 and 0.066±0.721, respectively. Thus milk production traits LY and 300 d LY exhibited 10 to 13% genetic variability in the herd. This suggest that to increase additive genetic variability in the herd, genetic material from outside herd needs to be introduced through induction of pedigreed sires from the field. The ONBS can be used for the improvement of an indigenous breed. The level of the genetic response depends on the size of scheme (i.e. number of participating herds or and total number of animals) and the selection intensity. Additionally, availability and effective use of AI will determine the impact of such a scheme especially for dairy cattle. An ONBS can initially be developed to form a focus for national sire breeding activities. In time and with experience the capacity can be expanded and ET introduced to increase the rate of genetic progress.

In a given herd and even at CBF, only 20% of the population is of elite category.The animals which have produced >2500 l in any lactation are designated as elite cows. A cow once declared elite remains elite throughout life time, but it may not repeat its performance in the subsequent lactation.

Thus the animals' expression to its maximum depends up to its genetic make-up and favourable environment for the expression of the genes.The entire Gir population in its purest form is about 7.0 lakh, which means you are likely to have 1.4 lakh elite Gir cows in Saurashtra. This is if all 7.0 lakh animals are maintained on similar plane of the highest nutrition and management. Highest milk yield recorded in the year 2012–13 was 36.5 l in Gir Cattle (Bulletin Dept. of A.H. 2012–13).

Hence even if the animal has potential to be elite it may not be able to express simply due to the reason that it was not provided required nutrition and management. Hence, even if the animal is low performing and below average it does not mean that the animals do not have the potential to reach elite category.

SUMMARY

Gir cattle in Saurashtra provide milk, manure and draught power. Animal genetic resources of native breeds are largely underutilized in India and indiscriminate crossbreeding has degraded large numbers of local breeds. This is also true with Gir cattle in its native breeding tract. (i) About two-

third population is either graded Gir or Gir like and hence not pure Gir, (ii) only one-third population i.e. 7.6 lakh could be 95% towards pure Gir. Hence, it is difficult to obtain large number of pure Gir animals. Since 2003–04 to 2012–13, contribution of Saurashtra to state total indigenous cattle milk yield is 60%. A 25 years data analysis on Gir cows at CBF revealed average lactation yield as 2029 litre in 321 days lactation length and 1843.8 litre milk yield in 300 days. Production performance of Gir cows in three districts:(1) Junagadh (2) Rajkot and (3) Bhavnagar showed that average test day milk yield in Gir cows over a lactation were 7.99±0.05 litre/d for Junagadh, 6.43±0.03 litre/d for Rajkot and 6.71±0.04 litre /d for Bhavnagar district, projected values for 300-days milk yield being was 2397, 1929, and 2013 litre for the three districts respectively. Average AFC in Gir cattle of the station herd was 1527.7±14.1 days (51 mth) whereas survey study in Junagadh, Rajkot and Bhavnagar districts indicated AFC in field Gir cows as 45, 49, and 46 month, respectively. Parity had a significant effect on total lactation milk yield in Gir cows at CBF. Highest total lactation yield was observed in 2nd lactation (2132±123.4 litre) while lowest was observed in 10th lactation (1456.8±219.1 litre). Milk production traits LY and 300-d LY exhibited 10 to 13 % genetic variability in the herd. This suggests that to increase variability in the herd, genetic material from outside herd needs to be introduced.

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