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## Phenotypical characteristics and rearing practices of Dagri cattle followed by tribal farmers of Narmada district of Gujarat

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### Abstract

A hill cattle population locally known as Dagri reared by tribals from eastern border districts of Gujarat adjoining to Madhya Pradesh and Rajasthan, mainly Dagri is found in mountainous regions, hilly terrains. The breeding tract of Dagri includes Panch Mahals, Dahod, Narmada, Chhotaudepur and Mahisagar districts of Gujarat. This was investigated for study the profile of rearing practices followed by tribal farmers of Dagri cow according to Age, Education, Total No. of Animal and Size of land holding of animal owner. The level of knowledge of Dagri cow owners about distinguish phenotypical characteristics of Dagri cow carried out following parameter: Hair Length, coat colour, skin colour, colour of muzzle, colour of hoof, tail twitch, horn shape, size of udder, size of teat and size of milk vein etc. Production traits include Frequency of Milking per day, Milk Production per day, Milk Yield per Lactation and Lactation length. Reproductive Traits include Age at Sexual maturity in Male/female, Age of First Calving, Service period and Calving Interval etc. The study carried out purpose of rearing, used of milk production and other utility of Dagri cow by Dagri cow owners, The survey of carried out rearing and management practices adopted by Dagri cow owners investigated by type of breeding, Grazing Practices, Stall feeding, Housing, Prophylaxis, disease control and Mortality at door step visit of animal owner. Dagri animals possessed predominantly white coat colour (90.66%). Muzzle colour was mainly black (77.66), curved horn and tail switch were mainly black, while hoof colour was mainly black colour. The udder small sized with round tipped cylindrical teats and with no prominent milk vein. Reproduction traits, viz. Age at Sexual maturity and age at first calving more than 5 year, Service period more than 6 months and Calving Interval between 1 to 2 year of majority of Dagri cow owner responded. In females, Production traits, viz. daily milk yield, lactation length and lactation milk yield were 0.5 to 2 lit, 200 to 300 days and less than 400 lit. respectively. These data were derived from farmers' personal interview at their doorstep.

**Keywords:** Phenotypical characteristics, cattle, Dagri, rearing practices

### Introduction

India is the seventh largest country in the world and is a mega-biodiversity centre (Srivastava *et al.*, 2019) [22]. Over 70 per cent of its people are engaged in vocations connected with farming and animal husbandry. In India, total livestock population is 535.78 million and among that 192.49 million are cattle, which is cover 35.94 percent of total livestock population of the country. The Indigenous/non-descript cattle population is 142.11million. (Anonymous, 2019) [23]. Which include 50 for cattle, 17 for buffalo, 34 for goat, 44 for sheep, 7 for horses and ponies, 9 for camel, 10 for pig, 3 for donkey, 1 for yak, 19 for chicken, 2 for duck and 1 for geese (Anonymous 2020) [2]. When we seeing global picture almost 30% of the world's cattle population of about 1.4 billion exist in India (Robinson *et al.*, 2014) [24]. India ranks first in milk production with 187.75 million tonnes of milk in 2019. The Indigenous cattle contribute 10% of total milk production in the country whereas non- descript cattle contribute 11% of total milk production in the country. Livestock breeds are recognized as significant components of world biodiversity because the genes and gene combinations they carry may be useful to agriculture in the future (Hall *et al.*, 1995) [5]. Diversified agro-ecological zones in India have helped to develop number of cattle populations. Breed characterization allows studying assessment of genetic variability, a fundamental element in working out breeding strategies and genetic conservation plans.

There are 50 recognized breeds of cattle in India, in addition to large number of non-descript cattle. In recent times, several of the indigenous breeds suffered decline mainly due to their becoming uneconomical. India has large number of breeds with wide genetic diversity than other countries. The local breeds have many merits over exotic breed's viz. better disease resistance than exotic breeds, more suitable for low input management system, survive better in local environmental condition, suitable for draught work. In addition; existence of superior indigenous breeds can provide valuable research inputs for developing superior breeds.

The indigenous cattle milk carries A2 protein, which is superior to A1 protein that is found in the milk of crossbred cattle. It is therefore important that Indigenous breeds of cattle are conserved, developed and proliferated. Breed registration and recognition is a very important step for breed certification and all relevant information regarding the enormous and bio diverse animal genetic resources of our country the procedure shall lead to formation of breed inventory and try identifying and understanding these unique genetic resources which shall ultimately facilitate the genetic improvement of the native livestock population. (Kansagra *et al.*, 2022) <sup>[7]</sup>

Gujarat has valuable genetic resources of cattle (Gir, Kankrej and Dangi), buffalo (Mehsani Jaffrabadi, Surti, and Banni), sheep (Patanwadi, Panchali, Marwadi), goat (Kachchhi, Surti, Zalawadi, Mehnsani, Gohilwadi, Kahmi), horses (Kathiawari, Marwari and Kachchhi-Sindhi) and camel (Kachchhi and Kharai), donkey (Halari) as well as poultry (Ankaleshwar and Busra) (Anonymous 2018) <sup>[25]</sup>. Still, several potential populations. The distribution of cattle breeds in Gujarat indicates central Gujarat and south Gujarat are represented by the non-descript population. (Patel *et al.*, 2021) <sup>[13]</sup>. A non-descript population of cattle reared by tribal people in the eastern hilly region of central Gujarat adjoining to Rajasthan and Madhya Pradesh was identified having uniform phenotypic characters distinct from different other recognized cattle breeds. The animals are smaller in size as compared to neighbouring breeds Malvi breed of Madhya Pradesh, Nari cattle from Rajasthan, Kankrej breed of Gujarat and well adapted to adverse climate condition and hilly terrain. Hence, present study was carried out to phenotypically characteristics hill cattle of tribal belt of Gujarat. The Dagri cattle breed with accession no. INDIA\_CATTLE\_0400\_DAGRI\_03046. was registered as 45th cattle breed of India and 4th cattle breed of Gujarat (Anonymous 2020) <sup>[2]</sup>.

Dagri is also known as "Gujarat Malvi". Dagri in colloquial language means 'Deshi' or old or native. Dagri cattle are distributed in Dahod, Chhotaudepur and parts of Mahisagar, Panchmahals and Narmada district of Gujarat. Coat colour is predominantly white, sometimes with grey shade. Small sized animal with compact body and straight forehead. Horns are curved upward in a lyre shape or straight with pointed tips. It is a draught purpose breed thus extensively used as animal for agricultural operations in hilly areas. Milk yield is less, 1.5-3.0 kg/day and 75-650 kg/lactation which is mainly used for

household consumption. Less feed requirement, survives mainly on grazing, hardly stall fed. Population size is approximately 2,80,000 (Patel *et al.*, 2021) <sup>[13]</sup>.

It can be survive in extreme heat conditions. Due importance of survival in extreme hard whether condition. it is necessary to study the distinguish phenotypically characteristics rearing and management practices of this breed which may be help to conserve this breed in future. Therefor the present study carried out with specific objectives.

### Methodology

The study was be conducted in Narmada district (Dediapada and Sagbara block) of Gujarat State as it is the jurisdiction of Krishi Vigyan Kendra-Narmada, Dediapada. Both block having highest population of Dagri cow, Selection of respondents are 15 from each villages and 10 village from each both two block were purposively selected for the study. Thus Total 20 Village survey carried out by Simple random method, Ex-post-facto research design was be used in proposed investigation, an interview schedule was be constructed by covering all dependent, intervening and independent variables collect required information and statistical analysis of percentage, rank for present study.

Information on various management practices opted by the livestock owners in the region and performance traits were generated by interviewing the farmers from 20 villages of 2 blocks in Narmada districts using a structured questionnaire. Farmers were interviewed to know the of the selected characteristics profile of tribal farmers of Dagri cow like age, education, Total no. of animal rearing and size of land holding. Details of the observations containing physical and morphological traits were recorded in the prescribed format provided by National Bureau of Animal Genetic Resources (NBAGR), Karnal for evaluation of breed of cattle and buffalo under field draught utility of hill cattle under field condition. Different morphological observations were recorded Dagri cattle by visiting several times to the area. The morphological observations include colour of body coat, hair, skin colour, colour of muzzle, tail switch, hooves, horns shape and teat shape, udder size, size of milk vain, etc. in females. physical characteristics were recorded of 300 Dagri cattle owners.

Production traits like Daily Milking during lactation period, Frequency of Milking per day, Milk Production per day, Milk Yield per Lactation and Lactation length. Reproduction traits include Age at Sexual maturity in Male, Age at Sexual maturity in Female, Age of First Calving, Service period and Calving Interval etc. performance were collected by conversation with the farmers from the surveyed villages. Farmers were interviewed for utility like Natural Farming, Use of Milk Production, Purpose of rearing and management rearing practices adopted by Dagari cow owners like Breeding, Grazing Practices, Stall feeding, Housing, Prophylaxis and disease control/ Mortality, Death in young one and prevalent diseases in the Narmada district.

## Results and Discussion

### 1. Study the profile of rearing practices followed by tribal farmers of Dagri cow

**Table 1:** Distribution of the selected characteristics of of tribal farmers of Dagri cow

Personal profile	Categories	No. of respondents	Percentage
Age	Young age (<35 years)	21	7.00
	Middle age (36 to 50 years)	154	51.33
	old age (> 50 years)	125	41.66
	Total	300	100
Education	Illiterate (No education at all)	46	15.33
	Primary education (up to 7th std.)	100	33.33
	Secondary education (8th to 12th std.)	151	50.33
	College education (Graduation and above)	3	1.0
	Total	300	100
Total No. of Animal	1 to 10	274	91.33
	11 to 20	19	6.33
	>20	7	2.33
	Total	300	100
Size of land holding	Marginal land land holding (<1 acre)	53	17.66
	Small land holding (1 to 2) acre	63	21
	Medium land Holding (2.01 to 4) acre	69	23
	Large land holding (>4 acre)	115	38.33
	Total	300	100

### 2. Study the level of knowledge of Dagari cow owners about distinguish phenotypical characteristics

**Table 2:** Selected characteristics and the level of knowledge of Dagri cow owners about distinguish Phenotypical characteristics of Dagri cow owners

1) Phenotypical characteristics of the Dagri breed			
Phenotypical characteristics	Categories	No. of respondents	Percentage
Hair Length	Sort	286	95.33
	Medium	14	4.66
	Total	300	100
Colour of Coat	White	272	90.66
	Red	19	6.33
	Black	9	3.00
	Total	300	100
Colour of Skin	Red	189	63.00
	Brown	103	34.33
	Black	8	2.60
	Total	300	100
Colour of Muzzel	Black	233	77.66
	Brown/pink	67	22.33
	Total	300	100
Colour of Hoof	Black	266	88.66
	Brown	34	11.33
	Total	300	100
Colour of Tail	Brown/Red	135	45.00
	white	27	9.00
	black	138	46.00
	Total	300	100
Horn Shape	Straight	24	8.00
	Curved	276	92.00
	Total	300	100
Size of Udder	Large	0	0
	Medium	95	31.66
	Small	205	68.33
	Total	300	300
Shape of teat	Cylindrical	266	88.66
	Funnel	34	11.33
	Total	300	100
Size of Milk vain	Large	4	1.33
	Medium	114	38.00
	Small	182	60.66
	Total	300	100

<b>2) Production traits</b>			
<b>Production traits</b>	<b>Categories</b>	<b>No. of respondents</b>	<b>Percentage</b>
Daily Milking during lactation period	Yes	296	98.66
	No	4	1.33
	Total	300	100
Frequency of Milking per day	1	14	4.66
	2	286	95.33
	Total	300	100
Milk Production per day (Lit)	1<	136	45.33
	1 to 2	108	36.00
	2>	56	19.33
	Total	300	100
Milk Yield per Lactation Days (Lit)	400<	288	96.00
	400-800	12	4.00
	>800	0	0
	Total	300	100
Lactation length (Days)	200<	157	52.33
	201 to 300	98	32.33
	>300	45	15.00
	Total	300	100
<b>3) Reproductive Traits</b>			
<b>Reproductive Traits</b>	<b>Categories</b>	<b>No. of respondents</b>	<b>Percentage</b>
Age at Sexual maturity in Male (Years)	3<	4	1.33
	3 to 5	108	36.00
	>5	188	62.66
	Total	300	100
Age at Sexual maturity in Female (Years)	3<	23	7.60
	3 to 5	109	36.33
	>5	168	56.00
	Total	300	100
Age of First Calving (Years)	3<	0	0
	3 to 5	40	13.33
	>5	260	86.66
	Total	300	100
Service period (Month)	< 3	2	0.66
	3 to 6	52	17.33
	>6	246	82.00
	Total	300	100
Calving Interval (Year)	1<	0	0
	1 to 2	142	47.33
	>2	158	52.66
	Total	300	300

### 3. Study the utility of Dagari cow by Dagari cow owners

**Table 3:** Utility of Dagari cow by Dagari cow owners

<b>Utility</b>	<b>Categories</b>	<b>No. of respondents</b>	<b>Percentage</b>
Natural Farming	Yes	97	32.33
	No	203	67.66
	Total	300	100
Use of Milk Production	Dairy	110	36.66
	Sale	22	7.33
	Value addition	12	4.00
	Home Purpose	156	52.00
	Total	300	100
Purpose of rearing	Draft purpose	105/300	35.00
	Agriculture Operation	189/300	63.00
	Agriculture Farm Manure	243/300	81.00

#### 4. To study the rearing practices adopted by Dagari cow owners

**Table 4:** The Rearing practices adopted by Dagari cow owners

Rearing practices	Categories	No. of respondents	Percentage
Breeding	Natural service	203	67.66
	Artificial Insemination	97	32.33
	Total	300	100
Grazing Practices	Yes	244	81.33
	No	56	18.66
	Total	300	100
Stall feeding	Green fodder	146/300	48.66
	Dry fodder	295/300	98.33
	Concentrate	107/300	35.66
	Min. Mix	61/300	20.33
	Chaffed fodder	20/300	6.66
Housing	Kuchha	282	94.00
	Pucca	18	6.00
	Total	300	100
Prophylaxis and disease control	Vaccination	216/300	72.00
	Deworming	146/300	48.66
	Treatment	252/300	84.00
Disease/Mortality/ Neonatal death	Yes	14	4.60
	No	286	95.33

Dagri cattle had white coat colour (90.66%) observed most common followed by red with sort hair length (95.33). Patel *et al.* (2021) <sup>[13]</sup> observed White coat was the most prominent colour (95.45% in males, 86.89% in females) with minor proportion of gray/grayish white (4.55% in males, 6.31% in females) Dagri cattle, Pundir *et al.* (2010) <sup>[17]</sup> reported that body coat of hill cattle of Almora district varied in different colours and shades, i.e. white (26.6%), black (19.6%), reddish/red (16.2%), brown (11.6%), gray (7.5%), reddish white (5.8%), greyish white (5.2%), black and white (2.9%), whitish brown (2.3%) and reddish-brown (2.3%).

During study colour of muzzle observed mostly black colour (77.66%) followed by brown colour (22.33%) With redish skin colour below coat. The muzzle colour was black in majority of cases (95.45%) followed by grey (4.55%) in males and pink (6.96%), grey (1.13%) and greyish white (0.16%) in female Dagri cattle (Patel *et al.*, 2021) <sup>[13]</sup>. while, black in Krishna Valley (Karthickeyan *et al.*, 2006) <sup>[26]</sup> and in Siri cattle (Bera *et al.*, 2016) <sup>[27]</sup>. In Maland Gidda, the muzzle colour was predominantly black, however, the muzzle colour was caroty or pinkish in fawn and white coat animals (Singh *et al.*, 2008) <sup>[20]</sup>.

Colour of hoof were found mostly black colour (88.66%) followed by majority of red coat colour animal were brown (34.33) colour hooves. Hooves were pale black (100%) in males and females of Dagri cattle (Patel *et al.*, 2021) <sup>[13]</sup>. Similarly, black hooves also reported in Ponwar cattle (Gaur *et al.* 2003) <sup>[4]</sup>, in local cattle of Assam (Kayastha *et al.*, 2011) <sup>[8]</sup> and in non-descript cattle of Konkan region (Khirari *et al.* 2014) <sup>[10]</sup>.

Tail end hair colour of Dagri cattle were found black (46.00%) and mainly brownish (45.00%) found in red colour coat population. Tail switch in Dagri cattle was mainly black (100% in males and 99.19% in females), however, in minor proportions brownish (0.16%) and white (0.49%) were observed in females (Patel *et al.*, 2021) <sup>[13]</sup>. Black coloured switch was observed by Singh *et al.* (2008) <sup>[20]</sup> in Malnad Gidda cattle of Karnataka and in Shahabadi cattle of Bihar (Rekha *et al.* 2012) <sup>[18]</sup>. Singh *et al.* (2011) <sup>[21]</sup> reported that the half of the population had black and remaining half of the

population had white tail switch in Vrindavani cattle.

The shape of horn in Dagri cattle were majority found curved (92.00%) followed by Straight (8.00%). The shape of horns was curved in males and females. Orientation of horns was upward and outward in males (100%) and females (93.46%); some minor proportion in female had upward (1.96%), downward (1.63%), forward (1.14%), outward (0.98%), backward (0.49%) and upward backward (0.33%) horns (Patel *et al.*, 2021) <sup>[13]</sup>. Rekha *et al.* (2012) <sup>[18]</sup> reported that the orientation of horns in Shahabadi cattle was outward, upward, inward with pointed tips in the majority of cases, while, Adgale *et al.* (2017) <sup>[1]</sup> observed mostly curved 92.34% and straight 7.66% horns in Khillar cattle.

Dagri cattle had small size udder (68.33%) followed by medium size (31.66%) with 88.66% Cylindrical shape of teat and mainly small size milk vein (60.66). Dagri cattle had bowl-shape small-size udder with a round-tipped cylindrical teat, milk veins were not prominent (Patel *et al.*, 2021) <sup>[13]</sup>. Similarly, Pundir *et al.* (2014) <sup>[15]</sup> also reported small udder with no prominent milk vein in hill cattle of Uttarakhand, while, Singh *et al.* (2008) <sup>[20]</sup> reported bowl shape small udder with funnel shape teat and pointed tips in Malnad Gidda cattle of Karnataka.

Frequency of Milking per 2 times (Morning and evening) per day during lactation period. Milk production per day were found less than 1 lit (45.33%), 1 to 2 lit. (36.00%) and more than 2 lit. (19.33%). lactation length were less than 200 day (52.33), 201 to 300 day (32.33%) and more than 300 day (15%) and total lactation milk yield were less than 400 lit (96%) of the Dagri breed of cattle where derived from farmers' interviews at their doorstep. The average daily milk yield and overall lactation milk yield in Dagri cow were 1.75±0.06 kg/day and 315.9±11.78 kg, respectively (Patel *et al.*, 2021) <sup>[13]</sup>. Sometime farmers are not milking at all and milk suckled completely by male calf. The present finding of daily milk yield is comparable to the findings reported by Pundir *et al.* (2013) <sup>[16]</sup> in Uttarakhand hill cattle (1.61 kg to 2.57 kg), by Iype *et al.* (2016) <sup>[6]</sup> in Kasargod cattle (1.4±0.04 kg). The overall mean lactation length based on 278 observations was 180 days. The overall lactation milk yield



was comparable to the findings of Kayastha (2006)<sup>[9]</sup> in Assam local (304.862 kg) and of Singh (2008)<sup>[20]</sup> in Manipur local cattle (312.49±3.68 kg) and by Sahoo *et al.* (2003)<sup>[19]</sup> in Malvi (915.6±21.7 kg).

The reproductive performance of Dagri cattle is presented in Table 2. There are no organized farms of this lesser-known population in the area. Hence, data were recorded at farmers' doorstep through personal interviews. The age at Sexual maturity in Male & female and age at first calving in Dagri cattle were mostly more than 5 year in male (62.66%) & female (56.00%) and more than 5 year respectively. The age at first oestrus and age at first calving in Dagri cattle were 40 months and 53 months (Patel *et al.*, 2021)<sup>[13]</sup>. The age at first estrus in present study was lower than reported by Iype *et al.* (2016)<sup>[6]</sup> in Kasargod cattle (24.9±0.5 months) but the age at first calving was higher than reported by Kayastha (2006)<sup>[9]</sup> in Assam local cattle (43.05±0.18 months), by Singh (2008)<sup>[20]</sup> in Manipur local cattle (42.95±0.08 months), by Kuralkar *et al.* (2015)<sup>[11]</sup> in Deoni (44.50±0.30 months) and by Pundir *et al.* (2014)<sup>[15]</sup> in Tripura indigenous cattle (44 months); by Iype *et al.* (2016)<sup>[6]</sup> in Kasargod (36.4±0.8 months). The higher age at first calving may be due to poor development of reproductive organs owing to poor nutrition.

The service period and calving interval in Dagri cattle were majority more than 6 months (82.00%) and 1 to 2 year (47.33%), more than 2 year (52.66%) respectively. The service period and calving interval in Dagri cattle were 220 and 500 days (Patel *et al.* 2021)<sup>[13]</sup>. The shorter service period than the present result was reported by Bainwad *et al.* (2017)<sup>[3]</sup> in Red Kandhari cattle as 139.92±0.66 days. Similarly, shorter calving interval than present finding was reported by Nivsarkar *et al.* (2000)<sup>[12]</sup> in Gaolao cattle as 387.00 days, by Phule and Maske (2012)<sup>[14]</sup> in Gaolao cattle as 387 days, by Bainwad *et al.* (2017)<sup>[3]</sup> in Red Kandhari cattle as 423.42±0.61 days. Table. 2.

The observations regarding the utility Dagri cow milk mainly home purpose/dairy and cow dung used for organic, natural farming & Agriculture Farm Manure. Dagri bullocks used for the Agriculture Operation and draught purpose. The task like ploughing is considered as hard work. Opinion and farmers' experience were also considered for the draught ability of Dagri bullocks (Table 3). To know the draught performance of the bullocks of the breed, 4 hr ploughing of agricultural land was done during September-October. The physiological parameters like body temperature, respiration and pulse rates, showed very positive results towards the adaptability of these cattle to hot humid climate of hilly area. Based on phenotypic characterization of Dagri cattle, it was found that Dagri is typical hill breed smaller than most of indigenous breeds except, Vechur, Panganur and other dwarf indigenous breeds. Based on production performance and draught performance, Dagri is judged to be a draught purpose breed (Patel *et al.*, 2021)<sup>[13]</sup>.

Dagri has excellent drought and heat tolerance capacity and best adapted to semi-arid climate of middle Gujarat and most suitable for agricultural operations in hilly area. Phenotypic characters includes, viz. body coat colour of cattle is predominantly white, sometimes with grey shade. Dagri cattle are small in size as compared to other breeds of Gujarat and most hilly breeds of the country. It has slender and compact body, straight forehead, prominent depression on inner side of both horn bases, prominent supraorbital groove. Dagri cattle are sturdy in nature, with moderate to tractable temperament

and are resistant to tropical diseases as compared to exotic or crossbreds and adapted well to the extensive housing system. Dagri cattle has less feed intake because of small size, hence it can survive mostly on grazing and is hardly stall fed (Patel *et al.*, 2021)<sup>[13]</sup>. Table. 3

The Rearing and management practices adopted by Dagri cow owners like breeding done by natural service (67.66%) followed by Artificial Insemination (32.33%). Majority of Dagri cow owners feed manage by grazing practices (81.33%) and stall feeding mostly done as dry fodder when pasture not available during summer season. During door stape survey mostly 94% housing of Dagri cattle found Kuchha floor. For Prophylaxis and disease control facilities provided by animal husbandry department but still require awareness regarding vaccination, deworming and treatment in Dagri cow owner. Disease/Mortality/neonatal death found less than 5.00% in Dagri Cattle. Table 4.

Pure animals are found in hilly tract of Dediapada. In plains like Sagbara block, purity is diluted due to inclusion of Narmada for execution of mandatory AI program from government aspiration district, grading up with Gir through AI is implemented. All AI born calves are Gir cross, red in colour and taller than pure calf inducing many cases of dystocia (as per discussion with local VO and owners). Hence, there is urgent need to establish breeding farm for Dagri cattle for its conservation and genetic improvement.

### Conclusion

Dagri cow breed is pure white and red in colour, with thin and straight/curved horn, small size of udder and Milk vein. Most of Dagri cow produce less milk production less than 2 lit. per day, Milk yield per lactation less than 400 lit. and lactation length most of less than 300 day per lactation. In Dagri cow, Age of sexual maturity in male/female most of cow have more than 5 years. Dagri cow is disease resistance to disease like foot and mouth. It can be survive in extreme heat conditions and less fodder requirements. 'The pahadi' Dagri cow's bullock is hard working and survive on whatever feed it is provided. bullocks of this breed are most suitable for farming in hilly terrains because of its smaller size, its feed requirement is less, making it more economical for tribal who have small farm holdings. It can be survived in extreme heat conditions which proved her strength against survival in extreme hard whether conditions. Based on the results of this study following points may be looked into very carefully to conserve this breed.

### For improving of indigenous Dagri cattle following strategies may be adopted

1. Need to work on how increase Milk production per individual cattle.
2. Need to work on Disease resistance power of Dagri cattle
3. Need to establish Dagri Breed Cattle farm for conservation of this breed and production of Dagri Bull semen for Artificial Insemination.
4. Provide Drinking water facilities in forest of Narmada district during grazing and required database fodder availability in forest during scarcity condition in summer.
5. Livestock Census may be conducted breed wise accurately which will help in formulation of appropriate breeding strategies for genetic improvement programs.
6. Establish/strengthening of nucleus breeding farms for all registered breeds in the respective breeding tract to

- produce superior germplasm for breeding.
7. Performance recording may be imitated in field/farmer herds.
  8. Genetic improvement through Open Nucleus Breeding System (ONBS) and Progeny Testing of bulls.
  9. Multiplication of elite germplasm by different reproductive technologies like cloning, embryo transfer etc.
  10. Value addition of milk products.
  11. Creation of awareness in masses for uniqueness of indigenous bovine germplasm.
  12. Efforts should be made for conservation, those breed needed conservation.
  13. Establishing *ex situ* and *in situ* conservation units in respective breeding tracts for those breeds needed conservation.
  14. Somatic cells at National Gene Bank for repository.
  15. Establishment of breed society for all registered breed.

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