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Phenotypic characterisation of Alambadi cattle—An unexplored indigenous population of south India

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ABSTRACT

Alambadi is one of the draught cattle of south India, distributed unevenly in the hilly tracts of Dharmapuri and Krishnagiri districts of Tamil Nadu and bordering Karnataka, with varying densities. It is a medium-sized animal, with the typical coat colour of iron-grey and distribution of white patches around eyes, above muzzle. The horns were cylindrical, slate-coloured, sloping backwards, spreading sideways and upwards, with a slightly forward slope at the upper half of the horns and ending with a pointed tip. The overall means for body length, chest girth and height at withers of adult bulls, bullocks and cows were 122.96±2.37, 145.50±2.97 and 120.63±1.35; 133.96±2.18, 168.15±2.20 and 134.41±2.30; and 127.52±0.47, 152.08±0.48 and 121.39±0.30 cm respectively. The average body weight of adult bulls, bullocks and cows were estimated as 293.96, 376.73 and 312.09 kg respectively. The means for daily partial milk yield, lactation length and estimated lactation milk yield were 2.60±0.01 kg, 171.16 days and 432.30 kg respectively. The overall mean fat, SNF, protein and total solids contents in raw milk were 3.58±0.13, 8.46±0.60, 3.22±0.05 and 12.01±0.13% respectively. The average age at first oestrus, age at first calving and calving interval of Alambadi cows were 3.33±0.07, 4.46±0.08 and 1.47±0.06 years, respectively. The population of Alambadi cattle (5,273) is categorized as 'not at risk'.

Keywords: Alambadi, Distribution, Morphometry, Performance characteristics

In the history of civilization, the major landmark was the domestication of animals, which occurred 12,000 years ago. The domestication led to animal biodiversity that had been evolved by the process of natural selection which causes the development of genetically distinct breeds in several places and they constitute to form a livestock as a whole. As stated by Littlewood (1936), Indian cattle breeds vary in most states or in districts, either as to form, size and symmetry or as to the growth and length of their horns, according to the local peculiarities of the climate, soil and lastly but not least, the fodder. The cattle of India have long been famous and of the several breeds in the part of the southern India are designated as Mysore type cattle breeds. Shortt (1889) described that these cattle were used for draught purpose because of their good spirit, endurances, activeness and quick in their paces, somewhat restive and fiery in disposition. One such Mysore type cattle in south India is Alambadi cattle, distributed in Dharmapuri and Krishnagiri districts of Tamil Nadu and along the border of Karnataka state. This germplasm is in the condition of deterioration over the years due to intensification of animal husbandry and widespread introduction of exotic breeds. The importance of Alambadi cattle lies in their draught potential, heat tolerance, disease resistance, adaptability to harsh agro-climatic conditions of the hilly tracts and ability to survive and perform under scarce feed and fodder resources. So far, this unique population has not been investigated systematically. Hence, the present study was undertaken to study the habitat, distribution, physical morphometric and performance characteristics of Alambadi cattle.

MATERIALS AND METHODS

A survey was undertaken from October 2017 to May 2018 in 29 villages of two districts in Tamil Nadu, viz. Dharmapuri and Krishnagiri, and adjoining the areas along the borders of Karnataka for delineating the breeding tract of Alambadi cattle. Data on geographical location, soil, vegetation and meteorology (for a period of 10 years) of the breeding tract were collected. The questionnaire was designed as per FAO (2012a) and NBAGR guidelines (2016) in order to collect the information regarding the socio-economic status of the farmers, production and reproduction traits, management practices and utility of the Alambadi cattle. Farmers (344) were interviewed and information was collected. Weight of calves at birth was measured using a spring balance and adult body weight

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estimated using the Agarwal's modified Shaffer's formula for Indian native cattle (Wangchuck *et al.* 2018). The morphological traits like coat colour, skin colour, muzzle colour, switch colour, horn colour and pattern, forehead profile, body conformation, udder conformation, hump, dewlap, profile of fore- and hind-limbs, chest and barrel shape were recorded. The body measurements, viz. body length, height at withers, chest girth, paunch girth, face length, face width, ear length, tail length, horn length, horn circumference (at base, mid and tip), horn distance (at base, mid and tip) and skin thickness were recorded in 939 animals of different age groups.

The complete records on daily partial milk yield data (morning and evening milking throughout the lactation length) of 25 Alambadi cows were collected from milk co-operative societies. Usually, the milking is done after allowing the calf to suckle, hence data on partial daily milk yield alone could be obtained. During data collection, information on the parity and stage of lactation were also collected. The traits such as mean daily milk yield, lactation length and lactation milk yield were arrived from the observations. Milk samples were collected from 95 Alambadi cows [Dharmapuri (n=48) and Krishnagiri districts (n=47)] during morning milking and were tested for percentages of fat, SNF, protein and total solids using standard tests. Milk fat was estimated by Gerber's method, the protein content in milk using Kjeldhal method, SNF by using the following formula (corrected lactometer reading/ 4 + (0.2 × fat %) + 0.36) and total solids calculated by adding fat and SNF contents of milk.

RESULTS AND DISCUSSION

Origin, habitat and distribution: The provenance of the Alambadi cattle population was traced from a village called Alambadi (in Chamrajanagar district of Karnataka state) which is on the other side of river Cauvery from Hogenakkal in Tamil Nadu. The cattle were otherwise called as *Mahadeswarabetta*, *Cauvery* or *Betsal*. The Alambadi cattle were found to be distributed unevenly in the areas, which constituted the hilly tract of Pennagaram taluk of Dharmapuri and Denkanikottai taluk of Krishnagiri districts, with varying densities (Fig. 1). Apart from these parts in Tamil Nadu, the cattle were sparsely distributed in and around the Alambadi village of Karnataka along the side of river Cauvery (Fig. 1). Thus, the tract of Alambadi is rocky-strewn on the elevation, containing large areas of deciduous forest which provide pasture for the herds of Alambadi cattle. At present, the Alambadi village is left with few houses as most of the village folks relocated to urban side. The distribution of Alambadi cattle surveyed in the present study is concordant with the observations recorded by Kristnasamiengar and Pease (1895), Gunn (1909), Littlewood (1936), Mudaliar (1956) and also with the reports of Porter *et al.* (2016).

The type of soil present in Dharmapuri district was red sandy soil and black soil and dark reddish brown, sandy and clay loamy soil in Krishnagiri district. The annual mean

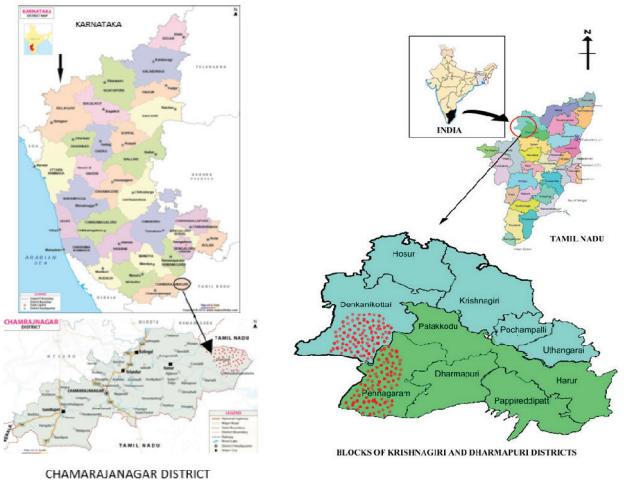

Fig. 1. Geographical distribution of Alambadi cattle in Tamil Nadu and bordering areas of Karnataka.

rainfall, maximum and minimum temperature, relative humidity (morning and evening) of Dharmapuri district were 896.6 mm, 32.8°C, 21.2°C, 73% and 48%; and the corresponding values for Krishnagiri district were 908.9 mm, 32.8°C, 22.2°C, 87.8% and 42.5% respectively. Major vegetation of the breeding tract included *Brassica mutica* (a plant in the mustard family), *Themada triandra* (red oat grass), *Alpud mutica* (Mauritian grass), *Celosia argentea* (cock's comb), *Dactyloctenium aegyptium* (crowfoot grass), *Heteropogon contortus* (spear grass), *Leptochloa chinensis* (Chinese sprangletop), *Tridax procumbens* (coat buttons), *Leonitis nepetaefolia* (Lion's ear), *Alternanthera brasiliana* (Branjilian joyweed) and *Anisomeles malabarica* (Malabar catmint).

Population status: The number of Alambadi cattle witnessed during the study in the breeding tract was 5,273; of which, 4,076 were breedable females, 169 breedable males, 63 bullocks and 960 calves. The total population of Alambadi cows had increased from 8,154 during 1909–10 to 12,732 during 1926–30 (Littlewood 1936). Thereafter, no report was available regarding the population status, i.e. from 1930 to 2000. Whereas Scherf (2000) reported that the population status of Alambadi breed was not at risk. It concurred with the status of Livestock Census (2007) that the estimated population of Alambadi was 31,874. However, the increase observed during 2007 is contrary to the present survey on population status of Alambadi cattle (i.e. 5,273 animals witnessed in the farmers' holdings). Hence, based on the recommendations of FAO, 2012b (Commission on Genetic Resources for Food and Agriculture), in respect of conservation status, the Alambadi cattle population could be classified as 'not at risk'.

The average herd size of Alambadi cattle was 16 which was higher than that reported in Bargur (11.65 animals; Ganapathi 2007) and lower than that reported in Pulikulam (225 animals; Singh *et al.* 2012), the other draught cattle breeds of Tamil Nadu. Most of the farmers had a pair of breedable females which were mainly used for draught purposes and this was not the case in any of the breeds of

Table 1. Mean (±S.E.) body measurements (cm) of Alambadi bulls, bullocks and cows

Character	Bull	Bullock	Cow	Overall
Body length	122.96^{c}±2.37 (31)	133.96^{a}±2.18 (28)	127.52^{b}±0.47 (332)	127.62**±0.48 (391) [7.38]
Chest girth	145.50^{c}±2.97 (26)	168.15^{a}±2.20 (26)	152.08^{b}±0.48 (320)	152.75**±0.54 (372) [6.82]
Height at withers	120.63^{b}±1.35 (32)	134.41^{a}±2.30 (32)	121.39^{b}±0.30 (353)	122.33**±0.36 (417) [6.07]
Face length	44.90^{b}±0.54 (30)	49.62^{a}±0.49 (34)	46.12^{b}±0.16 (357)	46.32**±0.16 (421) [6.99]
Face width	17.11^{ab}±0.40 (28)	17.56^{a}±0.29 (34)	16.18^{b}±0.12 (352)	16.36**±0.11 (414) [14.03]
Ear length	17.79^{c}±0.29 (28)	19.30^{a}±0.26 (32)	18.48^{b}±0.07 (327)	18.49**±0.07 (387) [7.23]
Tail length	102.27^{c}±2.55 (22)	115.38^{a}±1.56 (24)	107.82^{b}±0.56 (287)	108.00**±0.54 (333) [9.13]
Skin thickness (mm)	3.59^{b}±0.23 (23)	4.28^{a}±0.28 (23)	3.58^{b}±0.06 (306)	3.63**±0.05 (352) [28.26]
Paunch girth	166.44^{c}±3.97 (23)	183.50^{a}±2.66 (24)	175.19^{b}±0.79 (297)	175.19**±0.77 (344) [8.20]
Horn length	33.40^{c}±2.30 (29)	49.03^{a}±2.27 (29)	43.38^{b}±0.49 (293)	43.02**±0.52 (351) [22.75]
Horn circumference at base	19.93^{b}±0.66 (29)	23.33^{a}±0.46 (33)	18.51^{c}±0.13 (340)	19.01**±0.14 (402) [14.91]
Horn circumference at mid	16.29^{b}±1.37 (28)	19.39^{a}±0.45 (33)	15.13^{b}±0.12 (338)	15.57**±0.15 (399) [19.83]
Horn circumference at tip	4.30±0.15 (22)	5.38±0.42 (21)	4.64±0.17 (204)	4.67^{NS}±0.15 (247) [49.63]
Horn distance at base	6.03±0.35 (29)	5.84±0.41 (31)	6.00±0.13 (332)	5.99^{NS}±0.12 (392) [39.63]
Horn distance at mid	12.78±1.14 (29)	14.97±0.93 (31)	14.64±0.30 (334)	14.53^{NS}±0.28 (394) [37.63]
Horn distance at tip	16.08^{b}±1.46 (26)	25.41^{a}±2.70 (16)	20.19^{ab}±0.78 (201)	20.09*±0.70 (243) [54.19]
Body weight (kg)	293.96^{c}±13.10 (26)	376.73^{a}±10.12 (25)	312.09^{b}±1.86 (316)	315.22**±2.16 (367) [13.13]

Figures in round and square brackets are the number of observations and coefficients of variation (per cent) respectively; *, Significant (P<0.05); **, Highly significant (P<0.01); NS, Not significant. Means bearing same superscript within a row do not differ significantly.

draught cattle in Tamil Nadu.

Socio-economic status: The Alambadi farmers (66.16%) performed agriculture and farming as their main source of livelihood. The average land-holding size of a farmer was 2.62±0.17 acres with the range of 0.25 to 10 acres (n=250). The average family size was 6.00 with 73.05% of the families being nuclear type and the rest being the joint families. Major community responsible for rearing these cattle were *Vanniyar* (71.43%), followed by scheduled caste (9.09%), *Naicker* (7.79%), tribals (3.90%), fishermen (3.25%), *Lingayat* (2.60%) and *Gowdas* (1.95%).

Morphological characters: The coat colour of calves was generally iron grey (Fig. 2). In addition, ash-grey or fawn-coloured calves were also observed. The ash-grey coloured coat in calves became dark grey as the age advanced. The typical coat colour of Alambadi cattle was iron grey (20.0%) (Fig. 3); however, black (0.8%), light to dark grey (66.1%), fawn (3.9%) and white-coloured (9.2%) animals were also witnessed. The observed variants of coat colour in Alambadi cattle are in accordance with the earlier observations made by Gunn (1909) and Littlewood (1936). Presence of light grey to white coat animals in high frequency is in agreement with the reports of Littlewood (1936) and Pattabhiraman (1962). The chi-square test of significance for coat colour showed a highly significant (χ^2 value of 845.45; P<0.01) difference between the two districts. Irrespective of the coat colour, white patches were distributed around the eyes, on either sides of the face, dewlap and to some extent up to inguinal region. However, there was a wide variation in the extent and distribution of white patches; animals with no patches (fully dark and white coloured coat) to even unevenly distributed white patches on the body were also seen. Skin and eyelids were pigmented. Black and white eye lashes were noticed, whereas white eye lashes were present especially in animals with the white patches distributed around the eyes. Muzzle and eyes were usually black in colour.

Figs 2-3. **2**. Alambadi female calf – iron grey colour with white patches. **3**. Alambadi bull – iron grey colour with typical horn.

Table 2. Least-squares means, standard errors and coefficients of variation of daily partial milk yield (kg) in Alambadi cattle

	No. of observations	Mean±S.E.	Co-efficient of variations (%)
Overall	4146	2.37±0.02	35.14
Parity	Highly significant (P<0.01)		
1	525	1.98^{e}±0.04	42.26
2	265	2.19^{d}±0.05	39.52
3	1841	2.62^{b}±0.02	35.31
4	848	2.36^{c}±0.03	37.35
5	667	2.71^{a}±0.04	33.70
Stage of lactation	Highly significant (P<0.01)		
Early	2118	2.72^{a}±0.02	34.47
Mid	1516	2.36^{b}±0.02	38.24
Late	512	2.02^{c}±0.04	44.69

Number of observations on daily milk yield were from the complete milk records of 25 animals. Means bearing same superscript within effect do not differ significantly.

Table 3. Means, standard errors and coefficients of variation of milk constituents in Alambadi cattle

Milk constituent	Stage of lactation			Overall
	Early	Mid	Late	
Fat %	3.26^{b}±0.14 (62) [33.80] {1.6 – 8.1}	4.02^{ab}±0.28 (22) [32.16] {2.0 – 7.7}	4.53^{a}±0.37 (11) [27.71] {2.5 – 6.6}	3.58^{**}±0.13 (95) [34.73] {1.6 – 8.1}
SNF %	8.45±0.71 (62) [6.69] {6.63 – 9.52}	8.53±0.77 (23) [9.02] {6.76 – 9.52}	8.37±0.12 (10) [4.43] {7.69 – 8.86}	8.46^{NS}±0.60 (95) [7.10] {6.63 – 9.65}
Protein %	3.13^{b}±0.05 (44) [10.36] {2.6 – 3.9}	3.49^{ab}±0.12 (12) [12.11] {2.7 – 4.1}	3.60^{a}±0.10 (2) [3.93] {3.5 – 3.7}	3.22^{**}±0.05 (58) [11.65] {2.6 – 4.1}

Figures in round, square and curly brackets are respectively the number of observations, coefficients of variation (per cent) and ranges. **, Highly significant (P<0.01); NS, Not significant. Means bearing same superscript within a row do not differ significantly.

The head of Alambadi cattle was moderately long, narrow with prominent forehead. The horns were cylindrical and slate-coloured, sloping backwards, spreading sideways and upwards, with a slight forward slope at the upper half of the horns and ending with a pointed tip. Ears were round at the end and held horizontally. Small-sized hump, and small to medium-sized dewlap were noticed. The chest appeared narrow and well-ribbed; the barrel was moderately broad. The back appeared sloping upward up to the rump region and down towards base of the tail. The limbs were fairly long, strong and slender; the knee joint of forelimbs and fetlock joints in all the four limbs were dark-grey or black in colour. The tail was long usually ended up with a black switch. Majority of the cattle witnessed were possessing tight and compact build body, while a few animals loosely built. In Alambadi cows, the udder and milk vein was not so prominent; but having medium-sized cylindrical teats, squarely placed. In males, the preputial sheath was fairly visible, but not pendulous. The observed morphological characters of Alambadi cattle are in accordance with the earlier observations made by Littlewood (1936), Ware (1942) and Pattabhiraman (1962). The other breed which is closely associated with Alambadi was Hallikar which also shared part of its breeding tract in Karnataka state (Singh *et al.* 2008).

In general, the bullocks had higher body dimensions than bulls and cows (Table 1). The average body weight of adult bulls, bullocks and cows were estimated as 293.96, 376.73 and 312.09 kg respectively. The body weight in Alambadi cattle increased steadily from birth to sixth parity and maintained thereafter i.e. approximately up to 12 years of age.

The phenotypic correlations between the body length and height at withers, body length and chest girth, chest girth and height at withers were positive and very high, estimated as 0.92, 0.92 and 0.93 respectively. The body weight showed highly significant (P<0.01) positive correlation with the body length (0.78), height at withers (0.60), chest girth (0.93), tail length (0.84) and paunch girth (0.90).

Production performance: The averages for partial daily milk yield and constituents of milk in Alambadi cows are given in Tables 2 and 3. In general, the Alambadi cows were not milked by the farmers. With the minimum primitive level of management and the data recorded (full lactation) from few farmers (n = 25), the least square means for daily milk yield was found to be 2.37±0.02 kg (Table 2) which is higher than Umblachery (1.99 kg; Rajendran 2007) and Pulikulam (1.50 kg; Singh *et al.* 2012); but lower than Krishna Valley (3.17 kg; Karthickeyan *et al.* 2006) and Hallikar (3.10 kg; Singh *et al.* 2008) breeds of cattle. The maximum daily yield of 5.65 kg was recorded during the study. The average lactation length was 171.16 days (n= 25), with a range of 106 to 283 days which falls within the range of lactation length reported in Krishna Valley (5 to 8 months; Karthickeyan *et al.* 2006) and lower than that reported in Hallikar (12.30±1.1 months; Singh *et al.* 2008) cattle. The lactation yield was ranging between 838.46 kg and 266.14 kg with a mean of 432.30 kg. This value is lower than the estimated lactation yield in Kangayam cattle (540 kg; Rajendran 1995); but comparable with that of Bargur (468 kg; Ganapathi *et al.* 2013) cattle. Across parity, the co-efficient of variation ranged from 33.70 to 42.26% indicating that there is a scope for genetic improvement of Alambadi cattle in respect of milk yield.

The average fat and protein percent of 3.58 and 3.22 respectively (Table 3) estimated in the milk of Alambadi cattle are in close agreement with the findings of Rajendran (1995) for Kangayam cattle (3.89 and 3.21%). The fat per cent obtained in the present study is lower than the values estimated in Bargur (5.65%; Ganapathi 2007) and Umblachery (4.94%; Rajendran 2007) breeds. The mean SNF content of milk in the present study (8.46%) is in accordance with that of Bargur cattle (8.06%). The total-solids in Alambadi milk (12.01%) is higher than that of Kangayam (10.91%; Rajendran 1995), but lower than that of Bargur cattle (13.99%; Ganapathi *et al*. 2013). The

Table 4. Friedman test for the utility of Alambadi cattle

Utility	Mean rank	Chi-square value
Traction	1.90	186.82^{**}
Milk	2.42	
Breeding	2.68	
Manure	3.69	
Socio-cultural activity	4.32	

**, highly significant (P<0.01).

analysis of variance revealed that there was a highly significant difference (P<0.01) among the stages of lactation (i.e. early, mid and late lactation) for the traits of fat and protein per cent, but the stages of lactation was not the source of variation for SNF (Table 3). As the lactation advanced, concentrations of milk fat and protein per cent increased as positively influenced by the lower milk yield, as opined by Auldist *et al.* (1998) and there existed a negative correlation between milk yield and per cent milk constituents.

Reproduction performance: The average age at first oestrus, age at first calving, calving interval of Alambadi cows were 3.33±0.07, 4.46±0.08 and 1.47±0.06 years, respectively (n=82). The average reproductive lifetime of Alambadi cows ranged from a minimum of 6 to a maximum of 13 calvings with an average calf crop in its lifetime as 7. The average breeding age for bull was about 3 years and used up to 15 years of age. During the survey, two cases of twinning were witnessed and no case of reproductive problem was reported.

Calving distribution was worked out from 242 calvings recorded in different months during a period of one year. Highest calving was observed in February (24.64%), followed by April (17.23%), November (12.32%) and so on (Fig. 4). The trend of calving was uneven.

Utility: The Friedman rank test (Table 4) was done to find out the order of preference for utility of Alambadi cattle. It is a peculiarity that Alambadi cows were mainly used for agricultural purposes such as ploughing, field levelling and threshing. Average age at draught for both male and female was 3 to 3.5 years. Cows and bullocks were able to cover an area of 0.5 to 1 and 0.75 to 1 acre respectively in 8 hours according to the type of land.

All the Alambadi cows were not reared for milk, however, only a few cows were milked which was used for raising new-born children in that house and also to raise the goat kids that are weaned at an early age or orphaned. Few farmers sold the milk of Alambadi cows through co-operative societies along with their crossbred cow's milk.

Farmers also sold the manure obtained from Alambadi cattle at the rate of ₹ 2000 to 3000 per tonne. The herd size of more than 10 cattle were maintained mainly for producing

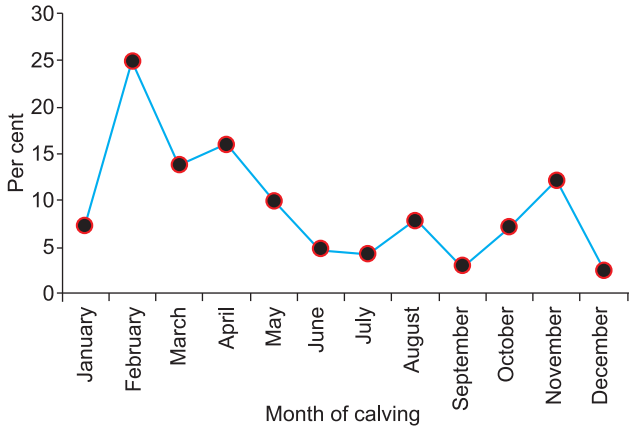

Fig. 4. Distribution of calving in Alambadi cattle.

the calves for expanding their herds. Surplus youngstock were sold at the rate of ₹ 20,000 to 30,000 per pair of females/ males to other farmers. In addition, the Alambadi cattle played an important role in the socio-cultural activities of farmers. These animals were also given to the bride-groom, as a gift at the time of marriage of their daughters. The whole herd of Alambadi cattle were separated and passed on to the legal heir apparent. During the *Pongal* festival (a famous festival for *Tamilians*) in the month of January, these indigenous animals were worshiped and few cultural events, viz. bull baiting (*Jellicut*), and *Erudhattam* (making the bulls roped on either side and allowing to run and being tamed) were organised in the villages.

Husbandry practices: In general, the Alambadi cattle were reared in a primitive level of management. Animals from different farmers' holdings were collected to form a herd size of 200 to 400, especially at the time of sowing operations during the months of June and July and sent to the deep forest for grazing. Temporary shelters were built in the forest for herders and animals. The cattle camp in the forest was called as '*patti*' and the animals were not tied up; and hence retained aggressive temperament making them difficult to control. About 39.02% of the cows were docile which were used for draught purposes, 32.93% medium-tempered and 28.05% of the animals were highly tempered in nature.

Animals were allowed for grazing during the day and housed in the temporary enclosures during the night time. At the time of harvesting, the animals were brought back to the native villages i.e. in the month of January. The animals were fed with hay (ragi and sorghum straws) and husk (husk of Toor dhal and broad beans) during the dry season because of scarcity of feeding resources. The animals were kept in open type of housing (91.35%) provided with enclosures, made up of locally available bamboo sticks or coracle and stones stacked up around.

Vaccination was done against foot and mouth disease in those places where the herds were easily accessible. Eggs of strongyles and also the oocysts of coccidia were identified through faecal examination. *Heamophysalis* species and *Hyalomma* ticks were observed on the coat of the animals. Even though the incidence of disease was low in Alambadi cattle, some of the common diseases affecting bovines such as ephemeral fever, haemorrhagic septicaemia, black quarter and also foot and mouth were reported. Deworming was not at all practiced. Few health issues were cured by indigenous medicines, prescribed by the traditional healers / tribals. The constraints in rearing Alambadi cattle were seasonal scarcity of livestock feed (65%) and restriction for grazing imposed in certain forest ranges (16.48%), calf mortality due to the predator attack (8.79%) and other socio-economic problems (8.79%) such as shortage of capital to invest on livestock breeding activity and labour scarcity (for herding and agricultural activities).

Breeding practices: Selection criteria for breeding females and males were related to their phenotypic appearances, viz. the coat colour, most preferably the

greyish shade, the horn pattern, whorls and hair marks on different parts of the body. The animals which were having the whorls on the back and on the forehead were preferred most. With the available breedable females and bulls, an overall sex ratio of 1:24 was maintained in the breeding tract. But a wider ratio of 1:200 was reported in the herds maintained in the forests. These animals grazed together in the fields or forest lands as herdmates and almost 90% of the females were bred naturally by the stud bulls. Controlled mating, using community breeding bull, was also practised for cows kept at home for the draught purpose at the cost of ₹ 250 to 300 per service. The frozen semen was not available for breeding Alambadi cows. In Alambadi bull, the average age of castration was around 3 to 3.5 years and the reason for castration was to make the animal docile, and handle with ease for agricultural operations and carting.

The Alambadi cattle was a medium-sized animal, with the typical coat colour of iron-grey and distribution of white patches around eyes, above muzzle and possessing a narrow cylindrical body. The livestock keepers of Alambadi were rearing these animals for over 3 to 4 generations, as responded to questionnaire, which indicate the existence of these animals over centuries, as an ancestral legacy. However, purity of the population has to be maintained, as there is a chance of mingling with the other Mysore-type cattle, Hallikar, because of its proximity with Hallikar breeding tract in Karnataka. The farmers having the preference of selecting the animals towards grey coat rather than the typical iron grey coloured animals and the prevalence of more number of crossbred cattle within the Alambadi herds meant for milk production are the other threatening factors. Selective breeding, establishment of breed societies, supply of superior Alambadi bulls / semen straws, nutritional management to tap the inherent milking capacity towards profitability are the viable options to strengthen the base, which become a part of future genetic security. In a recent development, Government of Tamil Nadu has initiated a step to conserve the Alambadi cattle, through a project by establishing a separate *in situ* centre in its breeding tract (Alambadi Cattle Breed Research Station under the control of Tamil Nadu Veterinary and Animal Sciences University).

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