Validation of the Indigenous Technical Knowledge of Indigenous Livestock Breeding and Management

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ABSTRACT

Indigenous knowledge of livestock breeding is often *"tacit"* and not necessarily expressed in the conventional form of scientific documentation. Indigenous livestock breeding systems rely mostly on qualitative traits than pure quantitative qualities. Qualitative traits are difficult to measure and most of the indigenous knowledge systems are in forms of qualitative traits. The lack of documentation and predominant qualitative nature makes it difficult to validate the ITK related to livestock breeding. In the current study, an attempt was made to validate ITK related to breeding of two indigenous draught power cattle breeds, Poda Thurpu and Nallamala-Kamma cattle, by the indigenous cattle breeders of two districts of Nagarkurnool and Kurnool, of Telangana and Andhra Pradesh respectively. QuIK (Quantification of indigenous knowledge) method was adopted for validation of ITK related to cattle breeding. Primary data (predominantly qualitative in nature) related to the criteria for selection of breeding bulls and unique characteristics desired by the indigenous breeders in the breeding stock had been captured through personal interviews and focus group discussions. Inductive coding method was adopted for generating codes naturally from the data itself. Based on the codes, pertinent biometry data of 595 cattle was collected to validate the ITK related to indigenous cattle breeding and management. Findings of the study suggests that over 90 percent of the cattle population of both the breeds show unique characteristics desired by the indigenous breeders.

Keywords: *Indigenous Knowledge (IK), Traditional Knowledge (TK), Indigenous Technical Knowledge (ITK), Indigenous Knowledge Research System (IKRS), and Indigenous Livestock.*

INTRODUCTION

Indigenous livestock breeds represent the collective knowledge and heritage of the communities they had been associated with, and may not thrive separately from the indigenous socio-cultural-economic-ecological production and knowledge systems. Such breeds will survive only when such indigenous systems in which they had been embedded also survives. Indigenous knowledge of livestock breeding is often "*tacit*" and not necessarily expressed in the conventional form, such as documentation in writing/recording etc. Indigenous livestock breeding systems rely mostly on qualitative traits (ability to walk long distances over difficult terrains, resistance to diseases, fend off-springs and ward-off predators and animals response and obedience to instructions of the master) than pure quantitative qualities (LPPS and Köhler-Rollefson, 2005). Much of the indigenous knowledge of livestock breeding had been orally transferred through generations, often through the means of indigenous traditions, culture and practice. Henceforth, survival of such indigenous socio-cultural systems and people with such knowledge is quintessential for both improvement and long-term conservation of indigenous livestock breeds and germplasm.

Over the centuries, indigenous livestock keepers of India, have learnt and applied the indigenous technical knowledge (ITK) to breed and improve indigenous livestock not only to suite their own needs and requirements but also to conserve and ensure survival of such breeds in difficult environments and terrains. The ITK system had been developed by the indigenous communities based on their experiences, continuous improvement through informal experimentation and transfer of such knowledge to next generations. The tried and tested rich ITK pertaining to agriculture, livestock and other allied sectors had been interwoven with the socio-cultural and traditional practices followed by them (Prakash et al, n.d.). Since time immemorial indigenous communities had been applying ITK in animal husbandry to increase milk production, fertility, retention of placenta, breeding, prolapse, care for the young stock and preparation of indigenous livestock products (Shubeena et al 2018). ITKs are often adapted according to the local culture and traditions, needs, and environment; they are very dynamic and continuously changing, and lay emphasis on minimizing the risks rather than maximizing profits (Prakash et al, n.d.).

ITK regarding animal husbandry is considered as old as domestication of livestock itself. Unfortunately, these age old practices, which were in practice widely throughout India, are seldom documented scientifically, consequently, they are now in danger of extinction. (De Amitendu, et al, 2004). Since independence all efforts in India had been exclusively focused on modern science based livestock breeding and management and promotion of allopathic-based veterinary services, entirely under control of the state. There had been a serious neglect and disapproval of ITK and practices to the extent that majority of the Indian society is not only unaware and unfamiliar with the ancient knowledge and literature but also extremely skeptical and cynical about it (Rangnekar, 1998). Livestock breeding and management programmes of the government and formal education curriculum of animal husbandry exclusively rely on and emphasize on knowledge and inputs of modern science from outside and remain extremely skeptical in acknowledgement and wider dissemination of indigenous knowledge research system (IKRS) (Ravikumar, et al, 2017). Thus it has become imperative not only to collect and document ITK systems and practices but also assess their validity scientifically.

METHODOLOGY

(a) Study Area

Nagarkurnool and Kurnool district of the Indian states of Telangana and Andhra Pradesh respectively, have been designated as the study area of the present study. The study was conducted at 27 villages, of 4 mandals of Nagarkurnool district of Telangana and 34 villages, from 6 mandals of Kurnool district of AP. The study area is geographically located in the Deccan plateau region of India. The topography of the area is highly undulating and hilly, covered in forests and tall grasses.

Nagarkurnool is located at 16.4833°N 78.3333°E, at an elevation of 458 mts. It has an area of 6924 km², comprising of 358 villages (including inhabited hamlets) and a total population of 861766 (Telangana, Gov. In, 2019). Kurnool district is located 15.6443° N, 78.1108° E, at an elevation of 273 mts. It has an area of 17,658 km², comprising of 921 villages and a total population of 40,53,463 (AP, Gov. In, 2019). The entire study area falls under in the scarce rainfall zones of India and receives a rainfall of 500 - 750 mm. Agro-ecologically it is located in the Deccan Plateau, hot arid eco -region and agro-climatically it is in the Southern Plateau and hills region (CRIDA, 2011).

(b) Materials and Methods

A rapid survey and reconnaissance study (Holtzman, 1986) was conducted during the year 2016 - 19, for systemic characterization of the indigenous Poda Thurpu Cattle population of Telangana (Siripurapu, *et al*. 2019) and Nallamala-Kamma cattle populations of Andhra Pradesh (AP). A total 202 (101 Poda Thurpu and 101 Nallamala-Kamma cattle) indigenous breeders, predominantly belonging to the Golla and Lambada (also known as Banjara) communities have been identified from 27 villages, of 4 mandals of Nagarkurnool district of Telangana and 34 villages, from 6 mandals of Kurnool district of AP.

For the purpose of primary data collection related to the ITK of cattle breeding, a total of 86 (45 Poda Thurpu cattle and 41 Nallamala-Kamma cattle) breeders belonging to the Golla and Lambada communities have been recruited as resource persons. Criterion sampling, a variant of the purposeful sampling technique (Creswell, 2013) had been adopted for selection of resource persons. Prior oral consent of resource persons had been taken for collection of primary data. Primary data pertaining to ITK of indigenous cattle breeding and management had been collected thorough personal interviews and focus group discussions (FGDs), administering a semi-structured questionnaire. During interactions, it was observed that indigenous cattle breeders attach a lot of significance to the breeding bulls. Therefore, primary data related to the criteria for selection of breeding bulls and unique characteristics desired by the indigenous breeders in the breeding stock had been captured for further inquiry.

Validation of few selected ITKs related to the selection of breeding stock had been done through QuIK (Quantification of indigenous knowledge) method (De Villiers, 1996). The basic principle of this method is that local communities know and understand the environment in which they live and answers for many questions can be found in the collective knowledge and experience of the community, livestock breeders in the present context. Indigenous livestock keepers who are perceived to be experts in the particular ITK had been consulted for triangulation and validation of the data. (Mahto, 2012, De Amitendu *et al*. 2004).

The data collected through personal interviews and FGDs was predominantly qualitative in nature and qualitative data analysis tools have been used for data analysis. Qualitative data was analyzed to arrive at data saturation for 'shared beliefs' (i.e. mentioned by two or more participant / sample village in each category), (Francis *et al*. 2010). Inductive coding method (Leech and Onwuegbuzie, 2007) was adopted to

initiate the coding process. Codes necessary for breaking the data into chunks (in this case, the head, gait, hair whorls, tail of the cattle, coat colour, etc.) have emerged naturally from the data itself (Leech and Onwuegbuzie, 2007; Fereday, Muir-Cochrane, 2006).

Following the finalization of codes (the head, gait, hair whorls, tail of the cattle, coat colour etc) which emerged from coding (table 1), local breeders were asked to choose codes / criteria that are not only very important for them but also quantifiable. While the indigenous cattle breeders of Poda Thurpu chose colour of the coat, horns and hooves and orientation of the horns as most important; the indigenous cattle breeders of Nallamala-Kamma cattle chose height and coat colour of the animal as important quantifiable variables.

Based on their choice, pertinent biometry data of the cattle had been collected from a total of 595 (303 Poda Thurpu cattle and 292 Nallamala-Kamma cattle), adult animals (above 4 years old), to generate empirical evidence to validate the ITK related to indigenous cattle breeding and management. Out of the total 595 cattle 196 (101 Poda Thurpu and 95 Nallamala-Kamma cattle) are breeding bulls. Biometry data of animals had been analyzed against the criteria suggested by the indigenous breeders. For instance, occurrence of desired colour of coat, horns and hooves and orientation of horns among Poda Thurpu cattle had been analyzed using the biometry data. Similarly, occurrence of desired height and coat colour was analyzed for Nallamala-Kamma cattle.

RESULTS AND DISCUSSION

(a) Indigenous Technical Knowledge of Cattle Breeding and Management

The data analysis has led to identification of few '*shared beliefs*', in relation to the indigenous criteria of selection of the breeding stock and unique characteristics desired by the indigenous breeders in the breeding stock of both the cattle breeds. Coding of the shared beliefs have resulted in identification of 14 broad criteria adopted by the indigenous cattle breeders for the selection of breeding bulls and 4 broad criteria to retain the female breeding stock in the herd *(table 1)*.

DISCUSSION

Both the indigenous cattle populations are of the draught power cattle group and are reared predominantly by the agro-pastoral Lambadi and Golla communities of the Telangana and AP state of the Deccan Plateau region of India. The populations had been maintained almost exclusively under agro-pastoral systems and represents a classic case of c*ommunity -based* improvement and conservation of the indigenous livestock germ plasm. The indigenous breeders strictly resist artificial insemination and cross breeding of the population with the exotic and other breeds and encourage only natural servicing (100 %). They follow selective breeding for maintaining high genetic purity, preferred physical features such as desired coat colour, orientation of horns, confirmation, size of the cattle, and capacity to thrive under harsh weather conditions and difficult terrains etc.

The Poda Thurpu is a small-compact sized cattle breed with wild but tactile temperament. The breed has predominantly light to dark brown speckles / blotches on a white coat (93.26 % Male, 88.2 % Female). The speckles / blotches should be preferably on cheeks and shoulders. The average height of cows is 111.84 cms, and breeding bulls is 119.38 cms (Siripurapu, et al. 2019). On the other hand the Nallamala-Kamma is a medium-size cattle with moderate temperament. The population has predominantly white coat, cows (89%) and majority of bulls (97%) have mixed coat (white with gray colour over the neck). The average height of cows is about 126.58 cm and bulls is 135.82 cm. The average herd size of Poda Thurpu cattle is 44.91 and Nallamala-Kamma cattle is 71.74 animal heads per herd.

Pedigree is patrilineal and calves are identified after their fathers in Lambadas and mostly matrilineal among the cattle breeders of the Golla community. Male calves are sold either for draught cattle or breeding bulls (*Poti kode*). Although any healthy male calf could potentially become a draught cattle when grown into an adult, but the same cannot be applied to breeding bulls. Usually local breeders do not let male calves born into their own herd to stay in the herd. Male calves which could potentially grow into breeding bulls are carefully selected using the age old indigenous knowledge. The selected male calves (future breeding bulls) are usually sold to other herders or exchanged but seldom kept in the same heard. The price of calf/breeding bull (2 year old) could be anywhere between INR 90k – 1 lakh.

- **Selection of the Breeding Bull of Poda Thurpu Cattle:** The selection of breeding bull is a very meticulous and lengthy process, which may last from two to four years observation and care. Either for a calf or an adult breeding bull, indigenous breeders use their own knowledge and characteristics of selection. For instance, the number and position of hair whorls is examined. The calf/ adult selected for breeding should have a single hair whorl on the forehead and one on the back, right behind the hump. There should not be two hair whorls together and there should not be any hair whorls over the tailbone. The gait is also observed carefully, the strides should be composed and firm. The stride should resemble a trot, lifting the feet off

- the ground and stepping firmly back, as if rocks would be crushed under the feet. There should not be any staggering or dragging of feet. The knees/limbs should not touch each other while walking.

  The breeders of Poda Thuru cattle prefer breeding bulls with strong copper brown horns that are curved and pointed forward. Breeders prefer bulls with broad and convex forehead, with a deep furrow in the center. Breeders select bulls with lean and short tails, with the tip of the tail switch ending above knees. As per them, a short and lean tail represents activeness and agility. In addition to impregnating cows, the breeding bull plays a major role in maintaining and protecting the herd. Breeding bulls usually lead the herd, warns/alerts and protects the herd from predators and other dangers.

- **Selection of the Breeding Bull of Nallamala-Kamma:** Male calves born during the 2 – 3 pregnancies are selected for breeding bulls. Locals say that similar to humans the mother cow is neither physically nor mentally prepared during the first pregnancy and animal loses virulence after the 3 pregnancy and usually gives birth to inferior calves. Similar to indigenous breeders of other regions of the sub-continent, local breeders also follow their own indigenous knowledge for selection of the breeding bull. The potential of a male calf is estimated within the first month by observing its legs (should be thick and strong), its rear (the posterior should be taller than the anterior), ears (should be large and wide), head (should be broad with strong horn buds), gait (should be firm and strong), colour (should be white), etc.

  Traditionally breeders find it a bit unacceptable to let animals' in-breed, as they consider it morally wrong because it is equivalent to incest. Therefore, calves selected for breeding are usually sold or exchanged with other breeders and seldom kept in the same herd in which they were born. This traditional practice prevents in-breeding and helps to maintain healthy genes. The breeding bulls are kept with the herd for 10 years and not slaughtered even after it pasts it's prime and grows old.

- **Indigenous Estimation of the Number of Times Cow had Calves:** As per the local communities a ring is formed over horns every time the cow gives birth. Number of rings over the horns gives an estimate of the number of times she gave birth.

- **ITK used for maintaining the Desired Height of the Nallamala-Kamma Cattle Population**: The Nallamala-Kamma cattle population is referred to locally as *Padigi Aavu* because of its 'specific height' and size (table 11). Local breeders of the Nallamala-Kamma cattle usually rely on ITK to maintain a specific height of the cattle population. For instance, breeders say that it is necessary to select and maintain a specific height and body size to enable the animal for life under harsh weather conditions, tolerate heat and hike hillocks with ease. Local breeders use a very simple and easily accessible and very effective indigenous technique to select animals with specific height and body size. Local breeders use the forearm and hands high measurement techniques to measure height of the animal. Using the forearm and hands high measurement local breeders select "*Padigi Aavu*" and "*Aidu Jaanala Aavu*" which are believed to be suitable for life in the hills and forests and extreme temperatures.

  Cattle breeding is the domain of men among the indigenous communities (Golla and Lamabada) and women do not interfere in the cattle breeding, however, they play a significant role in nurturing the young, and taking care of the old and sick cattle. Women in general have better sense of cattle health and wellbeing than their men counterparts. In general at both the study areas, cattle (cows/ bulls/oxen) are usually not slaughtered when they grow old and allowed to die a natural death.

CONCLUSION

Indigenous knowledge systems form the basis of informal research and development of farmers and indigenous livestock keepers. Farmers' are not passive consumers, it is high time to acknowledge the fact that they are thinkers, active problem solvers and innovators who develop for themselves most of the technology they use. For hundreds of years before today's national agricultural research systems have been established, farmers did their own research and development. Since the time immemorial, they have been innovating and integrating technology from different sources and continuing to test and adapt it on their farms, and they still do so even today. (Prakash et al, n.d.).

It was obvious from the study that indigenous knowledge of livestock breeding of the Golla and Lambada communities is "*tacit*" and does not necessarily exist in written or scientifically documented from. Certain preferences of the breeders like the number and position of hair whorls on the animal and their relevance to health and desired qualities of the

animal has to be investigated more scientifically. The indigenous traditional knowledge of livestock breeding should be documented, preserved and included in the conventional education curriculum of veterinary and animal sciences and animal breeding.

In the context of modern medicine, Mashelkar (2003) points out that the connection between modern science and traditional medicine, as well as the connection between modern medicine and traditional medicine had been abysmally poor in India. Not confined to modern medicine, this scenario applies across the spectrum of modern science and technology versus traditional knowledge and technology. Perhaps it is the time to acknowledge that knowledge generated in formal laboratories by modern scientists is not the only form of knowledge and it had been generated also by people since time immemorial in "laboratories of life". India could benefit enormously if it could bridge the existing gap between the modern science and traditional knowledge and bring together traditional knowledge, ITK, modern science and technology.

Considering the recent debates on plurality of knowledge (Berkes and Turner, 2006), which treats scientific knowledge to be rational, sequential and, therefore, superior to the traditional knowledge, perceived to be experiential and simultaneous. In the fields of ecological knowledge, however, it is now well established that such hierarchies do not carry much weight. Studies suggest that field experience based traditional knowledge, at times, was found to be more effective than laboratory based modern scientific knowledge (Dusek, 2006; Bhaduri and Singh, 2012).

The significance of indigenous knowledge had been recognized and applauded by also the modern science and policies at both national and international level. For instance, the Article 8 (i) of the Convention on Biological Diversity (CBD) recognizes the importance of indigenous knowledge and the Biological Diversity Act of 2002, of India provides the local communities, the opportunity to conserve the biological diversity, sustainable use of its components and gives direct access to fair and equitable sharing of benefits arising from the use of such biological diversity and associated TK. The Section (36) of the act requires the Central Government to promote conservation and sustainable use of biological diversity through *in situ* conservation and minimize the adverse effects on biological diversity.

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Table 1: Indigenous Criteria for Selection of the Breeding Stock

S. No	Code / Criteria	*Poda Thurpu* Cattle	Occurrence Among Breeding Bulls (n = 101)	Occurrence Among Breeding Cows (n = 202)	*Nallamala -Kamma* Cattle	Occurrence Among Breeding Bulls (n = 95)	Occurrence Among Breeding Cows (n = 197)
1.	Head width	Large and prominent.	Average: 20.17 cms	NA	Large and heavy	Average: 22.91 cms	NA
2.	Forehead	Convex with a deep	100 %	NA	Wide	NA	NA
3.	Hair whorls	Should have single hair whorl on the forehead and one on the back, right behind the hump. There should not be two hair whorls together and there should not be any hair whorls over the tailbone.			***On the back (over the spine)***: • Dhanaraasi sudi (Wealth hair whorl) is a single hair whorl located on top of the hump. It is considered the best. Breeding bulls with Dhanaraasi sudi are highly priced and are in demand. • Paataala sudi, is a single hair whorl located at the base of the hump towards the posterior side is considered second best to Dhanaraasi sudi.	About 80 % of the breeding bulls have Paataala sudi. About 20 % of the breeding bulls have Dhanaraasi sudi. Breeding bulls with Paatala sudi are more common than bulls with Dhanaraasi sudi.	Position of hair whorls on the dewlap is not applicable to cows.

S. No	Code / Criteria	*Poda Thurpu* Cattle	Occurrence Among Breeding Bulls (n = 101)	Occurrence Among Breeding Cows (n = 202)	*Nallamala -Kamma* Cattle	Occurrence Among Breeding Bulls (n = 95)	Occurrence Among Breeding Cows (n = 197)
3	Hair whorls (contd.)	Should have single hair whorl on the forehead and one on the back, right behind the hump. There should not be two hair whorls together and there should not be any hair whorls over the tail-bone.			• Dabbodu sudi, is the single hair whorl present close to the tail bone. • Poraka sudi, is the single hair whorl present over the tail bone. • Toda giri sudi, (hair whorl at thigh) is the single hair whorl present over the tail at the thigh region. *On the Dewlap*: • Potu sudi is the single hair whorl present on the left side of the dewlap. It is considered that a bull with Potu sudi is extremely virulent. • The bull with a hair whorl one on each side of the dewlap is considered good. • The bull with hair whorl only on the right side is considered unfit. *On the forehead*: • Manci sudi, is the single hair whorl present right at the center of the forehead. It is considered good. • Kumpati sudi, is the hair whorl present towards the muzzle.	About 80 % of the breeding bulls have Paataala sudi. About 20 % of the breeding bulls have Dhanaraasi sudi. Breeding bulls with Paatala sudi are more common than bulls with Dhanaraasi sudi.	Position of hair whorls on the dewlap is not applicable to cows.
4	Nature of hooves	Should be hard, thick, large, and firmly together, should not be split wide, and should not be loose.		NA	Should be hard, thick, large, and firmly together, should not be split wide, and should not be loose.		NA
5	Hooves colour	The colour should be copper brown.	Copper brown colour 91.01 %	Copper brown colour 89.20 %	NA	NA	NA
6	Tail length with switch	Should be lean and end above the knees – symbol of agility.	Average length: 119.17 cms	Average length: 113.12 cms		Average length: 106.78 cms	Average length: 101.41 cms
7	Gait	Strides should be composed and firm. The stride should resemble a trot, lifting the feet off the ground and stepping firmly back, as if rocks would be crushed under the feet. There should not be any staggering or dragging of feet.		NA	Strides should be composed and firm. The stride should resemble a trot, lifting the feet off the ground and stepping firmly back, as if rocks would be crushed under the feet. There should not be any staggering or dragging of feet.		NA

S. No	Code / Criteria	*Poda Thurpu* Cattle	Occurrence Among Breeding Bulls (n = 101)	Occurrence Among Breeding Cows (n = 202)	*Nallamala -Kamma* Cattle	Occurrence Among Breeding Bulls (n = 95)	Occurrence Among Breeding Cows (n = 197)
8	Legs	Should be thick and stout, and knees should not touch each other.		NA	Should be thick and stout, and knees should not touch each other.		NA
9	Horns colour	Should be copper brown in colour.	Copper brown colour 93.26 %	Copper brown colour 85.23 %	NA	NA	NA
10	Orientation of horns	Should be strong, curved, and pointed forward (esp. for breeding bulls)	Forward: 28.09 % Upward: 29.21 %	NA	Should be short, strong and wide at the base.	Average length: 15.35 cms	Average length: 19.38 cms
11	Coat colour	Brown speckles on a white coat (speckles should be on the cheeks and shoulders)	93.26 %	88.2 %	White coat among cows and White coat (with gray colour over the neck)	97 %	89 %
12	Height	Not applicable	Average Height: 119.38 cms	Average Height: 111.84 cms	Less than 4.5 feet (137.16 cms) at the shoulder	Average Height: 135.82 cms	Average Height: 126.58 cms
13	Response to instructions	Breeding bull should respond to the instructions of its care taker. It should play a major role in maintaining and protecting the herd. Breeding bulls are expected to lead the herd, warn / alert and protect the herd from predators and other dangers.			Breeding bull should respond to the instructions of its care taker. It should play a major role in maintaining and protecting the herd. Breeding bulls are expected to lead the herd, warn / alert and protect the herd from predators and other dangers.		
14	Observation period	0 - 4 years	Calves selected for breeding purposes are kept under observation for 4 years. It is allowed to mate and its progeny is observed for one generation. The bull will be retained if calves born to it exhibit the desired qualities (coat, hooves and horn colour). Else, it is gelded and sold or used for draught purposes.	NA	0 - 4 years	Male calves born during the 2 – 3 pregnancies are selected for breeding bulls. It is kept under constant observation since the time it was born till it is ready to mate when it is 4 years old.	NA