



Seemanchali sheep – An untapped germplasm in Eastern region of Bihar

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ABSTRACT

Seemanchali sheep, a unique and distinct germplasm, is distributed in Supaul, Araria and Purnea districts of Seemanchal region of Bihar. The coat colour of sheep was dark brown with patches of white markings throughout the body. The body of the sheep, except the ventral surface, was covered with coarse wool, which is sheared on regular interval. An average flock size was 36.5 with the range from 22 to 58. The estimated population size of Seemanchali sheep in the breeding tract was 20,000. The height at withers, body length and chest girth of Seemanchali sheep at 3 months of age were 50.34±0.25 cm, 48.22±0.31 cm and 55.46±0.28 cm; and 50.15±0.25 cm, 47.53±0.30 cm and 54.87±0.28 cm, respectively for male and female lambs. The same biometrical measurements at 12 months of age increased to 67.16±0.45 cm, 63.64±0.46 cm and 71.96±0.46 cm; and 63.16±0.22 cm, 60.44±0.23 cm and 64.19±0.23 cm, respectively for male and female lambs. Body weights of the lambs at 3 and 12 months of ages were 9.58±0.28 kg and 28.13±0.38 kg for ram lambs and 8.95±0.15 kg and 24.86±0.23 kg for ewe lambs, respectively. The age at 1st mating, age at 1st lambing and lambing intervals of Seemanchali sheep were 14.6 months, 19.3 months and 11.2 months, respectively. Lambing percentage studied across the breeding tract was observed as 72.5. Large farmers possessing more than 100 Seemanchali sheep generated more than 90% of their household income through Seemanchali sheep. Strategies to enhance the productivity of Seemanchali sheep *vis-à-vis* livelihood status of sheep farmers are discussed.

Keywords: Breed, Production, Reproduction, Seemanchali, Sheep

Agriculture, being the premier indispensable occupation of the country, provides sustenance and even opulence to millions. However, sole dependency only on cultivation of crops makes the farmers daunting at many occasions due to fluctuating fortunes arising from seasonal binding on agriculture. Fortunately, the distress from uneven income from agriculture is partially or even fully compensated by the farmers by rearing different species of livestock at many locations. The extent to which livestock contributes to the rural economy in the country raises the pitch of slogan 'Livestock for Livelihood' strongly in the recent years. Among different livestock species, sheep and goats act as buffer currency in the economy of small and marginal farmers due to low investment and high returns among all species in the livestock production system of the country. Sheep in Bihar is an inevitable species in certain pockets due to their unique production performance in high potential low production areas of the state. Being capable of sustaining the entire livelihood of medium to large family, rearing sheep is the primary occupation for many in Shahabad and Seemanchal regions of the State. The State already possesses one registered breed 'Shahabadi' which is distributed in Shahabad region of Bihar. Unearthing unique populations across the universe in recent years

provides scope for enumeration and identification beyond exploitation of unique traits, if any. Though Eastern region of the country is the wealthiest region by having 30% livestock population of the country, the number of explored populations with unique and distinctive inheritable characteristics is very few. Unique germplasms are considered as national property in view of Intellectual Property Rights and hence exploration, evaluation and enacting to registration has become mandatory now-a-days in order to protect them from exploitation. With this perspective, a field study was undertaken in Supaul, Araria, Purnea and Katihar districts of Seemanchal region of Bihar to study the new germplasm (Seemanchali sheep), and its characteristics, production and reproduction potential as well as their role in enhancing the livelihood of sheep farmers.

MATERIALS AND METHODS

A field study was undertaken to study the distribution, morphological characteristics, and production and reproduction performances of Seemanchali sheep by visiting 95 sheep farmers in 39 villages in Supaul, Araria, Purnea and Katihar districts of Bihar from June 2020 to May 2021. The sheep with identical morphological features were examined and the pattern of inheritance of phenotypic characteristics was studied. The breeding tract of Seemanchali sheep was determined by examining the availability of sheep with similar phenotypic characters in

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the bordering areas of Supaul, Purnea and Katihar districts. Geographic and demographic distribution of such animals was studied in the entire breeding tract by randomly choosing villages where sizeable sheep populations were available. Standard formats and questionnaire were prepared based on the guidelines given for characterization of farm animals published by Food and Agriculture Organization (FAO 1986). Morphological features of the sheep were studied by visual observation whereas morphometric and body weight characteristics were studied by taking direct measurements of sheep belonging to varying age groups. The age of sheep was determined by dentition. The morphometric and body weight traits were measured to 0.1 cm and 0.1 kg accuracy. Data on reproduction particulars and the socio-economic status of farmers were derived from information collected from the sheep farmers. Collected data were validated before they were subjected into statistical analyses as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Habitat of Seemanchali sheep: Seemanchali sheep were distributed in Supaul, Araria, Purnea and Katihar districts of Bihar with more true-to-type animals found in Purnea district. The sheep were sparsely distributed in their breeding tract with the flock size ranging from 22 to 58. The average flock size was 36.5 with 2.3 rams, 21.4 ewes, 6.2 ram lambs and 6.6 ewe lambs. Seasonal variation in flock sizes was also noticed as the farmers had relatively thin flocks during lean season when the grazing sources were limited. Chandran *et al.* (2013) reported the presence of Shahabadi sheep in the same State. However, the breeding tract of Seemanchali sheep found in the present study is far off (more than 400 km) from the breeding tract as reported for Shahabadi sheep. Further, Seemanchali had unique characteristics which are not found in Shahabadi sheep.

Morphological features: Seemanchali sheep were medium in size with three varying coat colours throughout the body (Figs.1-3). They were either predominantly light brown (42.3%) or dark brown (31.4%) or completely black (26.3%). In most of the light coloured sheep, there were patches of dark colour in the head and neck regions.

The sheep were covered with coarse wool throughout the body leaving ventral thoracic and abdominal regions. The morphological features observed in Seemanchali sheep were completely different from Shahabadi sheep as Chandran *et al.* (2013) reported the coat colour of Shahabadi sheep to be generally light brown in nature. On the contrary, the coat colour of Seemanchali sheep had some resemblance with Chottanagpuri sheep whose coat colour was reported to be mostly brown in colour, some are white, black, or black and brown (Kasyap *et al.* 2020). These findings indicate that Seemanchali sheep might have originated either from Shahabadi sheep or Chottanagpuri sheep or by mixture of these breeds at varying levels.

Males possessed short horns in 64.3% cases with an average length of horns being 8.6 cm. The females were mostly polled. The horns were crescent shaped with the tip pointing forward or downward. On the contrary, only 17% of males in Shahabadi sheep possessed horns (Chandran *et al.* 2013) and all the rams were horned in Chottanagpuri sheep (Kasyap *et al.* 2020). Muzzle, eyelashes and hooves were black in colour. Tail was long with a mean length of 38.63 ± 0.30 cm for one-year old female lambs. Short tail is the characteristic feature of sheep breeds of India in majority of the cases. However, presence of long tail has also been reported for Muzaffarnagari sheep (Mandal *et al.* 2000) and Shahabadi sheep (Chandran *et al.* 2013). Udder was small in size with two laterally oriented teats.

Population size: The study indicated that the estimated population size of Seemanchali sheep was around 20,000 as estimated from Livestock Census 2017 (Table 1). As such the population was significantly higher in Supaul and Katihar districts of Bihar, the two extremes of the breeding tract. Further, it was reported that the population showed an alarming declining trend in the breeding tract. On comparing the population of this breed with that of Shahabadi sheep, the latter had a vast breeding tract and the population estimate in the year 2013 was 1,66,418 (Chandran *et al.* 2013). Probably sheep rearing history for the last 30 to 40 years may throw light on population dynamics of Seemanchali sheep.

Detailed study on the population statistics of this sheep



Fig. 1. Light and dark brown Seemanchali ewe.



Fig. 2. Black Seemanchali ewe.



Fig. 3. Seemanchali flocks in the breeding tract.

may be helpful in finding the number of breedable females in the sheep. If the population is less than 10,000, then situation may warrant to undertake some sort of measures for conservation of this sheep. The district-wise estimated population of Seemanchali sheep is given in Table 1.

Morphometric characteristics: Morphometric characteristics of Seemanchali lambs at the age of 3, 6, 9 and 12 months of age are given in Table 2. Chest girth was the highest body measurement at all ages followed by height at withers and body length. Further, it was found that all the body measurements were increasing at a decreasing rate as the age advanced. Between 3 and 12 months of

Table 1. District-wise estimated population of Seemanchali sheep in the breeding tract

Sl. No.	District name	Sheep population*	Estimated Seemanchali population
1	Supaul	15328	10,700
2	Araria	3250	2,600
3	Purnea	472	400
4	Katihar	9119	6,300
Total		28,169	20,000

* Bihar Statistical Handbook (2014).

age, the chest girth increased by 18.1% whereas the height increased by 26.7%. Arora *et al.* (2014) reported almost similar findings in female Malpura lambs at 3 months of age with height, length and chest girth to be 46.73 ± 0.34 cm, 51.94 ± 0.32 cm and 55.19 ± 0.35 cm, respectively. However, the same authors reported little higher value for the similar measurements for 6 month-old ewes (58.06 ± 1.21 cm, 62.52 ± 1.34 cm and 67.49 ± 1.46 cm, respectively).

Study on the morphometry in adult Seemanchali sheep indicated that the trend of having broad chest girth continued till adult stage. Though the growth almost stopped till 6-teeth stage, there was some marginal increase in all morphometric traits up to full mouth stage. The height, body length and chest girth obtained in the study was lesser than those reported for Kajali sheep of Punjab (72.18 ± 0.17 cm, 72.69 ± 0.71 cm and 83.02 ± 0.27 cm, respectively) by Mishra *et al.* (2016). However, Seemanchali sheep had

Table 2. Morphometric characteristics (in cm) of Seemanchali sheep under field conditions

Age and Sex	Height at withers	Body length	Chest girth	Face length	Ear length	Tail length
3 Months						
Male	50.34 ± 0.25	48.22 ± 0.31	55.46 ± 0.28	14.10 ± 0.43	14.06 ± 0.28	30.14 ± 0.26
Female	50.15 ± 0.25	47.53 ± 0.30	54.87 ± 0.28	14.14 ± 0.50	13.66 ± 0.27	30.45 ± 0.20
6 Months						
Male	58.15 ± 0.42	57.82 ± 0.53	65.23 ± 0.54	14.44 ± 0.38	14.54 ± 0.32	32.91 ± 0.58
Female	57.74 ± 0.33	54.72 ± 0.32	57.57 ± 0.32	14.48 ± 0.30	14.48 ± 0.29	32.06 ± 0.32
9 Months						
Male	63.42 ± 0.47	60.34 ± 0.44	69.25 ± 0.48	15.46 ± 0.38	15.19 ± 0.36	35.78 ± 0.56
Female	60.25 ± 0.27	58.53 ± 0.26	67.12 ± 0.26	15.18 ± 0.32	15.24 ± 0.30	35.33 ± 0.30
12 Months						
Male	67.16 ± 0.45	63.64 ± 0.46	71.96 ± 0.46	16.68 ± 0.35	16.53 ± 0.36	39.88 ± 0.36
Female	63.16 ± 0.22	60.44 ± 0.23	64.19 ± 0.23	15.77 ± 0.28	16.14 ± 0.28	38.63 ± 0.30
2-Teeth						
Male	65.24 ± 0.35	65.52 ± 0.32	81.50 ± 0.31	19.15 ± 0.19	19.31 ± 0.22	39.27 ± 0.32
Female	60.22 ± 0.28	62.56 ± 0.27	75.22 ± 0.27	17.64 ± 0.19	15.23 ± 0.21	36.94 ± 0.30
4-Teeth						
Male	67.55 ± 0.33	68.57 ± 0.29	84.33 ± 0.28	21.28 ± 0.18	20.67 ± 0.21	40.48 ± 0.30
Female	62.15 ± 0.27	64.63 ± 0.26	77.15 ± 0.25	18.58 ± 0.16	16.45 ± 0.20	37.44 ± 0.28
6-Teeth						
Male	69.22 ± 0.48	70.44 ± 0.35	86.18 ± 0.32	22.53 ± 0.17	21.21 ± 0.17	41.63 ± 0.32
Female	64.72 ± 0.25	66.15 ± 0.24	81.56 ± 0.23	19.78 ± 0.16	16.21 ± 0.23	38.44 ± 0.27
Full mouth						
Male	69.48 ± 0.31	71.63 ± 0.30	87.63 ± 0.31	23.35 ± 0.20	21.41 ± 0.22	42.24 ± 0.32
Female	65.33 ± 0.22	67.40 ± 0.21	81.43 ± 0.23	20.41 ± 0.12	16.40 ± 0.22	38.36 ± 0.30

greater body dimensions than the South Indian sheep such as Hassan (61.2 ± 0.26 cm, 62.9 ± 0.25 cm and 73.8 ± 0.43 cm, respectively) and Mandya (55.3 ± 0.28 cm, 61.4 ± 0.24 cm and 70.5 ± 0.31 cm, respectively) as reported by Jain *et al.* (2014). Variation in the morphometric characteristics may be due to genotype or environment or genotype $\times$ environment interactions.

Body weight: Body weights obtained in the present study (Table 3) for Seemanchali sheep showed that there is a huge variation in the trait at different ages providing scope for sheep breeders for improving the sheep productivity. Body weight at three months of age (9.58 ± 0.28 kg) increased to 18.56 ± 0.32 kg in 6 months registering 93.7% incremental gain. The per cent gain in body weights from 6 to 9 months, and from 9 to 12 months was 39.4% and 8.7%, respectively, showing that the body weight trait increased at decreasing rate after 6 months of age.

The body weights obtained in the present study were lesser than the body weights obtained for Kajali sheep of Punjab (18.12 ± 0.46 kg at 1-3 months of age and 23.93 ± 0.61 kg at 3-6 months of age; Mishra *et al.* 2016), Chitarangi sheep (19.53 ± 0.56 kg at 1-3 months of age and 26.99 ± 0.90 kg at 3-6 months of age; Mishra *et al.* 2020) and Macherla sheep (17.80 ± 0.24 kg at 3 months of age; Reddy *et al.* 2021). Comparing the body weights of Seemanchali sheep at different ages with other sheep breeds of India shows

Table 3. Body weights (in kg) of Seemanchali sheep under field conditions

Age group	Male	Female
3 months	9.58 ± 0.28	8.95 ± 0.15
6 months	18.56 ± 0.32	14.63 ± 0.23
9 months	25.87 ± 0.30	19.53 ± 0.21
12 months	28.13 ± 0.38	24.86 ± 0.23

that Seemanchali is a medium sized sheep of Eastern region of Bihar. Variation in body weights among different sheep breeds in India might be due to varying genotype and the environment in which these sheep are reared.

Reproduction performance: The field study showed that the age at 1st mating and age at 1st lambing in Seemanchali sheep were 14.6 and 19.3 months, respectively. Mishra *et al.* (2016) reported almost similar age at 1st mating (12-15 months) and age at 1st lambing (17-20 months) for Kajali sheep also. Similarly, Reddy *et al.* (2021) reported almost similar age at 1st lambing (552.15 ± 7.27 days) for Macherla sheep of Andhra Pradesh. However, higher age at 1st mating (572.39 ± 6.59 days) and age at 1st lambing (773 ± 8.77 days) were reported by Mehrotra *et al.* (2019) for Chokla sheep. The lambing percentage in the flock was 72.5 and the lambing interval 11.2 months. Generally, an ewe was observed to give birth to a single lamb at one lambing with an occasional twinning. The lambing rate was estimated as 0.9.

Environmental factors in the breeding tract: Seemanchali

sheep were maintained in semi-intensive system of rearing during summer. Though the housing was provided to almost all flocks, the houses were just temporary and constructed with locally available materials such as thatch and bamboo sticks. These materials were regularly replaced by sheep farmers once in 3 to 5 years depending on the conditions. Contrary to these management practices, sheep farmers of Punjab provided *pucca* houses in 46.77% of surveyed flocks (Mishra *et al.* 2016).

With respect to breeding, Seemanchali sheep were subjected to a breeding system in which rams were never scientifically selected. There were also no reports of exchange of rams between different flocks too. Almost 20% of older ewes were replaced every year by ewe lambs. Genetic improvement in the sheep reared in Bihar is almost negligible due to orthodox breeding methods adopted by sheep farmers.

Seemanchali sheep were maintained mainly on grazing. The flocks were taken for grazing 8 to 10 h daily. These findings are in complete agreement with those observed by Mishra *et al.* (2016) for Kajali sheep of Punjab. Apart from grazing, the Seemanchali sheep were not provided with any other additional supplementation. The present status management shows that there is definitely a scope for improvement in the productivity if the nutritional requirements are met out.

In the health perspective, the sheep in the breeding tract were provided need based treatment through locally available resource personnel. Major disorders often reported by the farmers were enterotoxaemia, enteritis, acidosis and some common respiratory disorders. Overall mortality, as reported by the farmers, during the last 5 years ranged from 5.6 to 27.8% with an average of 8.7%. Rate of mortality observed in the present study is also similar to the findings of Mishra *et al.* (2020) who observed 5-10% of mortality in most of the sheep herds of Chitarangi sheep.

Socio-economic status of sheep farmers: On comparing the rearing of sheep and goats in the breeding tract, the major difference was the number of farmers rearing sheep or goat in a particular cluster. Though goats were the most preferred small ruminant among the farmers, sheep were reared by less number of farmers but reared as a large herd. As the flock size is comparatively larger in case of sheep, the farmers spend at least more man-days for effective management of flocks.

Socio-economic study in the breeding tract revealed that the farmers possessing large flock fetched more income mostly through sale of young lambs (Table 4). The study further revealed that the sheep farmers were deriving major share of their household income from rearing Seemanchali sheep as they have undertaken rearing of sheep as full-term profession.

Strategies for improving productivity of Seemanchali sheep: Seemanchali sheep is a virgin germplasm reared by the sheep farmers in the Eastern region of Bihar. The sheep

Table 4. Socio-economic status of farmers rearing Seemanchali sheep in Bihar

Parameter	Small farmers (<50 herd size)	Medium farmers (Herd size: 50 to 100)	Large farmers (> 100 herd size)
Prevalence (in per cent)	23.7	36.1	40.2
Average herd size of sheep	28.4	63.7	122.8
Major occupation	Sheep rearing and labour works	Sheep rearing	Sheep rearing
Family size	7.8	7.1	8.3
Literacy rate	12.1	10.5	14.2
Per cent income through sheep rearing	40.6	60.4	90.2

is promising and present wide variations in the performance traits, an essential feature required for the breeders to work on it for genetic improvement. The population of sheep in the breeding tract seems to be diminishing due to disinterest of farmers in sheep rearing business, mainly due to stagnation of escalating profit in the sector. Hence, in order to improve the status of Seemanchali sheep in the breeding tract, the policy makers may consider the following five point strategies for improving economic status of sheep farmers. Firstly, the role of middleman in sheep market should be reduced to fetch more money in hands of sheep farmers. Secondly, a Seemanchali breed society can be established in the breeding tract to monitor and assist the sheep farmers in breeding, health and marketing. Thirdly, a large nucleus breeding farm should be established in order to produce genetically superior male germplasm through Open Nucleus Breeding System. Fourthly, an effective extension mechanism is required under field conditions to support sheep farmers. Finally, a sheep meat processing plant may be established in the breeding tract for exploring exportation which may provide employment opportunities to many.

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