



MORPHOMETRIC ATTRIBUTES OF INDIGENOUS PIGS IN TAMIL NADU

^{a*}Sangli Vikram Kumar, K., ^bBalasubramanyam, D., ^cSivaselvam, S.N. and ^dTensingh Gnanaraj, P.

^aDepartment of Crop Production (Animal Husbandry), The Indian Agriculture College, Radhapuram, Tirunelveli – 627 111, Tamil Nadu

^bPig Breeding Unit, Post-Graduate Research Institute in Animal Sciences, Kattupakkam – 603 203, Tamil Nadu

^cDepartment of Animal Genetics and Breeding, Madras Veterinary College, Chennai – 600 007, Tamil Nadu

^dInstructional Livestock Farm Complex, Madhavaram Milk Colony, Chennai – 600 051, Tamil Nadu

*Corresponding author – svkagb@gmail.com

ABSTRACT

The pigs contribute around 2.01 % of the total livestock population of India. The population of pig in the country is 10.29 million (19th Livestock Census, 2012). The total indigenous pig population in India is 7.837 million and it is 1.53 lakhs in Tamil Nadu. Body weight and body measurements were recorded in indigenous pigs at different ages *viz.*, 0 – 1 month of age, 2 – 6 months of age, 7 – 9 months of age, 10 – 12 months of age and above 12 months of age. The overall least-squares mean for body weight at 0 – 1 month, 2 – 6 months, 7 – 9 months, 10 – 12 months and above 12 months of age were 2.41±2.31, 28.39±1.87, 57.82±2.12, 61.19±2.39 and 74.17±2.10 kg; for body length were 17.96±2.32, 47.58±1.88, 64.80±2.13, 75.31±2.40 and 78.78±2.11 cm; for snout length were 4.14±1.04, 12.48±0.84, 17.31±0.96, 18.39±1.08 and 19.07±0.95 cm; for ear length were 15±0.73, 10.54±0.59, 14.31±0.67, 118±0.76 and 16.31±0.67 cm; for tail length were 8.15±0.88, 18.68±0.71, 24.45±0.81, 26.85±0.91 and 29.98±0.80 cm; for height at withers were 18.67±1.84, 46.92±1.49, 58.41±1.69, 64.87±1.90 and 70.35±1.68 cm; for chest girth were 24.56±5.27, 62.47±18, 84.49±4.84, 95.45±5.45 and 104.01±4.80 cm; for neck girth were 17.73±2.26, 46.29±1.83, 63.21±2.07, 69.95±2.33 and 73.55±2.06 cm; for paunch girth were 19.47±3.29, 59.05±2.67, 80.61±3.02, 82.92±3.40 and 102.28±2.99 cm respectively. Teat numbers for male and female were 9.92±0.07 and 9.93±0.07, respectively. Despite decreasing trends in population, the *desi* pigs still represent a valuable component of indigenous animal genetic resources. No systematic attempt has been made so far to study about the morphometric attributes of indigenous pigs of Tamil Nadu.

KEY WORDS: Morphometry, Indigenous pigs, Tamil Nadu.

INTRODUCTION

The pigs contribute around 2.01 % of the total livestock population of India. The population of pig in the country is 10.29 million (19th Livestock Census, 2012). The total indigenous pig population in India is 7.837 million and it is 1.53 lakhs in Tamil Nadu. About 60 % of the swine population in Tamil Nadu is indigenous pigs and widely distributed in all parts of Tamil Nadu. Pigs have wide adaptability to grow under different agro-climatic conditions. Despite decreasing trends in population, the *desi* pigs still represent a valuable component of indigenous animal genetic resources. No systematic attempt has been made so far to study about the morphometric attributes of indigenous pigs of Tamil Nadu and hence, they continue to thrive under poor management and nutrition. A scientific knowledge base on the farming conditions of indigenous pigs is also not available even though they form an integral part of small holder farming systems and play a significant role in some rural communities for their economic upliftment. This study has been taken up to characterize indigenous pigs in Tamil Nadu with the following objectives: Survey of indigenous pigs in Tamil Nadu and identification of distinct populations and for phenotypic and morphological characterization of distinct populations. It is now believed that the study of phenotypic and morphological traits to

evaluate the production potential of indigenous pigs is most warranted.

MATERIALS & METHODS

The total number of animals surveyed was 10442. The total number of indigenous pigs measured was 1059 of which 511 were males and 548 were females. Body weight and body measurements were recorded at different ages *viz.*, 0 – 1 month of age, 2 – 6 months of age, 7 – 9 months of age, 10 – 12 months of age and above 12 months of age. Morphometric traits studied were body weight (kg), snout length (cm), ear length (cm), tail length (cm), chest girth (cm), body length (cm), height at withers (cm), neck girth (cm), paunch girth (cm) and number of teats (No.). All the morphometric traits were measured using measuring tape except number of teats. Majority of these measurements were taken in centimetre with an accuracy of 0.5 centimetre. Recorded morphometric data were subjected to exploratory and descriptive analyses.

Pair-wise comparisons were made for significant source of variation using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957). The parameters were analysed using IBM SPSS software version 20.0 for Windows.

The following statistical model was used to analyse the effect of different non-genetic factors on all the traits

studied. The analysis for number of teats did not include age as a factor of variation.

$$Y_{ijklmnopq} = \mu + A_i + C_j + H_k + E_l + B_m + T_n + W_o + S_p + e_{ijklmnopq}$$

$Y_{ijklmnopq}$ = Morphological trait of the q^{th} animal belonging to p^{th} sex, o^{th} wattle presence, n^{th} top line, m^{th} belly type, l^{th} ear shape and orientation, k^{th} head shape and orientation, j^{th} coat colour and i^{th} age.

A_i – Effect of i^{th} age

C_j – Effect of j^{th} coat colour

H_k – Effect of k^{th} head shape and orientation

E_l – Effect of l^{th} ear shape and orientation

B_m – Effect of m^{th} belly type

T_n – Effect of n^{th} top line

W_o – Effect of o^{th} wattle presence

S_p – Effect of p^{th} sex

$e_{ijklmnopq}$ – Random error associated with each observation, NID (0, σ^2_e)

RESULTS & DISCUSSION

The previous studies on morphometric traits for indigenous pigs were carried out mostly in 7 – 9 months of age and very few studies were reported in the other age groups. Body weight (Table 1) of 0 – 1 month piglets was lower than the values reported by Nath and Deka (2003) in large black pig of Assam. At 2 – 6 months of age, body weight was higher than the values reported by Huang *et al.* (2005) in Wuzhishan pig of Beijing. At 7 – 9 months of age, lower body weight was recorded when compared to the findings of Naskar *et al.* (2007) in Tamworth and *desi* crossbred pigs, Pankaj *et al.* (2013) in Niang-Megha pigs and Ritchil *et al.* (2014) in Bangladesh indigenous pigs. At 10 – 12 months of age, body weight was higher than the findings of Subalini *et al.* (2010) in Sri Lankan village pigs and lower than the values reported by Pan *et al.* (2005) in Ghungroo pigs.

TABLE 1: Morphometric measurements (mean±S.E.) of male and female indigenous pigs

Age groups	Sex (n)	Body weight (kg)	Snout length (cm)	Ear length (cm)	Tail length (cm)	Body length (cm)
0 – 1 month	Male (33)	2.82±3.31	3.97±0.84	3.99±1.36	7.46±1.34	19.09±3.28
	Female (43)	1.26±3.71	4.44±2.19	4.51±0.67	8.98±1.33	15.71±3.80
	Pooled (76)	2.41±2.31	4.14±1.04	15±0.73	8.15±0.88	17.96±2.32
2 – 6 months	Male (367)	27.71±2.48	12.37±0.63	10.37±1.02	18.33±1.00	49.16±2.46
	Female (311)	28.12±3.31	12.64±1.95	10.84±0.60	19.18±1.19	44.98±3.40
	Pooled (678)	28.39±1.87	12.48±0.84	10.54±0.59	18.68±0.71	47.58±1.88
7 – 9 months	Male (57)	56.04±2.88	15.86±0.73	14.84±1.18	24.06±1.16	68.02±2.85
	Female (73)	58.19±3.60	18.48±2.12	14.06±0.65	25.07±1.29	60.77±3.69
	Pooled (130)	57.82±2.12	17.31±0.96	14.31±0.67	24.45±0.81	64.80±2.13
10 – 12 months	Male (19)	58.49±3.71	18.31±0.95	13.44±1.53	28.81±1.50	76.32±3.68
	Female(42)	62.03±3.74	18.72±2.20	14.85±0.67	26.28±1.35	73.04±3.84
	Pooled (61)	61.19±2.39	18.39±1.08	118±0.76	26.85±0.91	75.31±2.40
Above 12 months	Male (35)	77.73±3.07	18.79±0.78	15.89±1.26	29.33±1.24	80.56±3.04
	Female (79)	71.87±3.49	19.40±2.06	16.64±0.63	30.66±1.25	76.00±3.58
	Pooled (114)	74.17±2.10	19.07±0.95	16.31±0.67	29.98±0.80	78.78±2.11

Table 1 contd....

Age groups	Sex (n)	Height at withers (cm)	Chest girth (cm)	Neck girth (cm)	Paunch girth (cm)
0 – 1 month	Male (33)	19.28±2.70	20.48±3.85	18.80±3.22	19.29±4.39
	Female (43)	16.76±2.90	28.05±11.16	15.52±3.68	18.14±5.65
	Pooled (76)	18.67±1.84	24.56±5.27	17.73±2.26	19.47±3.29
2 – 6 months	Male (367)	48.21±2.02	56.39±2.88	47.35±2.42	56.62±3.29
	Female (311)	44.35±2.59	68.41±9.96	44.12±3.29	59.77±5.05
	Pooled (678)	46.92±1.49	62.47±18	46.29±1.83	59.05±2.67
7 – 9 months	Male (57)	59.57±2.35	80.34±3.35	64.36±2.80	80.76±3.82
	Female (73)	55.82±2.81	87.87±10.82	60.59±3.57	78.90±5.48
	Pooled (130)	58.41±1.69	84.49±4.84	63.21±2.07	80.61±3.02
10 – 12 months	Male (19)	66.22±3.03	93.85±4.31	74.15±3.61	84.39±4.92
	Female(42)	62.65±2.92	99.96±11.25	66.47±3.71	81.75±5.70
	Pooled (61)	64.87±1.90	95.45±5.45	69.95±2.33	82.92±3.40
Above 12 months	Male (35)	67.55±2.51	99.65±3.57	75.02±2.99	102.53±4.07
	Female (79)	69.67±2.72	108.63±10.49	70.99±3.46	101.21±5.32
	Pooled (114)	70.35±1.68	104.01±4.80	73.55±2.06	102.28±2.99

n = number of observations

Body length (Table 1) at 7 – 9 months of age was higher than the value reported by Borkotoky *et al.* (2014) in Naga local pigs and lower than the findings of Violeta *et al.* (2009) in Lithuanian indigenous pigs and Sahoo *et al.* (2012) in Ghungroo pigs. In adults, the body length recorded was higher than the findings of Dandapat *et al.* (2010) in Mali pig of Tripura, Subalini *et al.* (2010) in Sri Lankan indigenous pigs and Ritchil *et al.* (2014) in indigenous pigs of Bangladesh.

Chest girth (Table 1) at 7 – 9 months of age was higher than the value reported by Borkotoky *et al.* (2014) in Naga local pigs and lower than the findings of Violeta *et al.* (2009) in Lithuanian indigenous pigs and Sahoo *et al.* (2012) in Ghungroo pigs. In adults, it was higher than the findings of Subalini *et al.* (2010) in Sri Lankan village pigs, Nidup *et al.* (2011) in Bhutan pigs, Ritchil *et al.* (2014) in indigenous pigs of Bangladesh and lower than

the findings of Dandapat *et al.* (2010) in Mali pigs of Tripura.

Snout length (Table 1) in adults was higher than the findings of Dandapat *et al.* (2010) in Mali pig of Tripura. Height at wither (Table 1) at 7 – 9 months which was higher than the findings of Violeta *et al.* (2009) in Lithuanian indigenous pigs and in adults, it was higher when compared with the findings of Subalini *et al.* (2010) in Sri Lankan village pigs, Sahoo *et al.* (2012) in Ghungroo pigs, Ritchil *et al.* (2014) in indigenous pigs of Bangladesh and lower than Dandapat *et al.* (2010) in Mali pigs of Tripura.

Paunch girth (Table 1) at 7 – 9 months of age was higher than the findings of Borkotoky *et al.* (2014) in Naga local pigs and lower than the findings of Sahoo *et al.* (2012) Ghungroo pigs.

Ear length (Table 1) at 7 – 9 months of age was higher than the values reported by Borkotoky *et al.* (2014) in Naga local pigs and lower than the findings of Sahoo *et al.* (2012) in Ghungroo pigs. In adults, it was higher than the findings of Dandapat *et al.* (2010) in Mali pigs of Tripura, Nidup *et al.* (2011) in Bhutan pigs and Ritchil *et al.* (2014) in Bangladesh indigenous pigs.

Tail length (Table 1) at 7 – 9 months of age was higher than the values reported by Borkotoky *et al.* (2014) in Naga local pigs and lower than the findings of Sahoo *et al.* (2012) in Ghungroo pigs. In adults, it was higher than the findings of Dandapat *et al.* (2010) in Mali pigs of Tripura,

Subalini *et al.* (2010) in village pigs of Sri Lanka, Nidup *et al.* (2011) in Bhutan pigs, and Ritchil *et al.* (2014) in indigenous pigs of Bangladesh.

Teat number (Table 1) in all age groups was almost similar to the findings of Yaetsu *et al.* (1987) and Ritchil *et al.* (2014) in indigenous pigs of Bangladesh, Nidup *et al.* (2011) in Bhutan pigs, Borkotoky *et al.* (2014) in Naga local pigs. However, higher number of teats was reported by Dandapat *et al.* (2010) in Mali pigs of Tripura, Subalini *et al.* (2010) in village pigs of Sri Lanka and Sahoo *et al.* (2012) in Ghungroo pigs.

In the present study, sex had highly significant ($P<0.01$) effect on chest girth and paunch girth and significant ($P<0.05$) effect on tail length. In Naga local pigs, all morphometric traits showed no significant ($P<0.05$) difference between sexes (Borkotoky *et al.*, 2014). But, Subalini *et al.* (2010) reported that girth size, body length, height at withers did not differ significantly ($P<0.05$) between the two sexes of village pigs of Sri Lanka. However, Deka *et al.* (2002) in Hampshire pigs showed that sex had a significant effect on body weight. Head shape and orientation had highly significant ($P<0.01$) effect on body weight, chest girth and significant ($P<0.05$) effect on paunch girth. Top line had high significant ($p<0.01$) effect on height at withers and significant ($P<0.05$) effect on tail length, body length, chest girth and paunch girth.

TABLE 2: Least-squares means(\pm S.E.) for morphometric traits

Effects	Body weight (kg)		Snout length (cm)		Ear length (cm)		Tail length (cm)	
	n	Mean \pm SE	n	Mean \pm SE	n	Mean \pm SE	n	Mean \pm SE
Overall mean	1059	44.80 \pm 1.91	1059	14.28 \pm 0.86	1059	11.94 \pm 0.61	1059	21.62 \pm 0.73
Age	**		**		**		**	
0 – 1 month	76	2.41 ^c \pm 2.31	76	4.14 ^d \pm 1.04	76	4.25 ^d \pm 0.73	76	8.15 ^e \pm 0.88
2 – 6 months	678	28.39 ^d \pm 1.87	678	12.48 ^c \pm 0.84	678	10.54 ^c \pm 0.59	678	18.68 ^d \pm 0.71
7 – 9 months	130	57.82 ^c \pm 2.12	130	17.31 ^b \pm 0.96	130	14.31 ^b \pm 0.67	130	24.45 ^c \pm 0.81
10 – 12 months	61	61.19 ^b \pm 2.39	61	18.39 ^{ab} \pm 1.08	61	14.28 ^b \pm 0.76	61	26.85 ^b \pm 0.91
Above 12 months	114	74.17 ^a \pm 2.10	114	19.07 ^a \pm 0.95	114	16.31 ^a \pm 0.67	114	29.98 ^a \pm 0.80
Coat colour	NS		NS		*		NS	
Black	892	45.50 \pm 1.45	892	14.33 \pm 0.65	892	11.92 ^{ab} \pm 0.46	892	21.93 \pm 0.55
Black with white	157	45.36 \pm 1.63	157	14.99 \pm 0.73	157	12.84 ^a \pm 0.52	157	22.29 \pm 0.62
Black with brown	10	43.54 \pm 3.99	10	13.52 \pm 1.80	10	11.05 ^c \pm 1.27	10	20.64 \pm 1.52
Head shape and orientation	**		NS		NS		NS	
Straight	998	42.74 \pm 1.77	998	14.23 \pm 0.80	998	12.06 \pm 0.56	998	21.42 \pm 0.67
Convex	61	46.85 \pm 2.32	61	14.33 \pm 1.04	61	11.82 \pm 0.74	61	21.83 \pm 0.88
Ear shape and orientation	*		NS		NS		NS	
Erect	513	43.95 \pm 1.94	513	14.13 \pm 0.87	513	11.78 \pm 0.61	513	21.66 \pm 0.74
Droopy	546	45.65 \pm 1.95	546	14.43 \pm 0.88	546	12.10 \pm 0.62	546	21.59 \pm 0.75

Effects	Body weight (kg)		Snout length (cm)		Ear length (cm)		Tail length (cm)	
	n	Mean \pm SE	n	Mean \pm SE	n	Mean \pm SE	n	Mean \pm SE
Overall mean	1059	44.80 \pm 1.91	1059	14.28 \pm 0.86	1059	11.94 \pm 0.61	1059	21.62 \pm 0.73
Belly	NS		NS		NS		NS	
Flat	991	45.29 \pm 1.82	991	14.57 \pm 0.82	991	12.24 \pm 0.58	991	21.65 \pm 0.69
Pot	68	44.31 \pm 2.26	68	13.99 \pm 1.02	68	11.63 \pm 0.72	68	21.59 \pm 0.86
Top line	NS		NS		NS		*	
Straight back	603	45.05 \pm 1.94	603	14.37 \pm 0.87	603	12.08 \pm 0.62	603	21.92 \pm 0.74
Arched back	456	44.55 \pm 1.95	456	14.19 \pm 0.88	456	11.80 \pm 0.62	456	21.32 \pm 0.74
Wattles	NS		NS		NS		NS	
Present	32	44.72 \pm 2.61	32	14.07 \pm 1.17	32	11.63 \pm 0.83	32	21.19 \pm 0.99
Absent	1027	44.87 \pm 1.65	1027	14.49 \pm 0.74	1027	12.24 \pm 0.52	1027	22.05 \pm 0.63
Sex	NS		NS		NS		*	
Male	511	44.13 \pm 1.94	511	14.20 \pm 0.87	511	11.93 \pm 0.62	511	21.29 \pm 0.74
Female	548	45.46 \pm 1.95	548	14.36 \pm 0.88	548	11.95 \pm 0.62	548	21.95 \pm 0.74

Morphometric attributes of indigenous pigs in Tamil Nadu

Effects	Body length (cm)		Height at withers (cm)		Chest girth (cm)		Neck girth (cm)	
	n	Mean±SE	n	Mean±SE	n	Mean±SE	n	Mean±SE
Overall mean	1059	56.89±1.92	1059	51.84±1.53	1059	74.20±4.37	1059	54.15±1.87
Age	**		**		**		**	
0 – 1 month	76	17.96 ^c ±2.32	76	18.67 ^c ±1.84	76	24.56 ^c ±5.27	76	17.73 ^c ±2.26
2 – 6 months	678	47.58 ^d ±1.88	678	46.92 ^d ±1.49	678	62.47 ^d ±4.28	678	46.29 ^d ±1.83
7 – 9 months	130	64.80 ^e ±2.13	130	58.41 ^c ±1.69	130	84.49 ^e ±4.84	130	63.21 ^c ±2.07
10 – 12 months	61	75.31 ^b ±2.40	61	64.87 ^b ±1.90	61	95.45 ^b ±5.45	61	69.95 ^b ±2.33
Above 12 months	114	78.78 ^a ±2.11	114	70.35 ^a ±1.68	114	104.01 ^a ±4.80	114	73.55 ^a ±2.06
Coat colour	NS		NS		NS		NS	
Black	892	58.50±1.46	892	53.05±1.16	892	77.03±3.31	892	56.52±1.42
Black with white	157	57.50±1.64	157	53.01±1.30	157	76.67±3.73	157	56.98±1.60
Black with brown	10	54.66±4.00	10	49.48±3.18	10	68.89±9.10	10	48.93±3.90
Head shape and orientation	NS		NS		**		NS	
Straight	998	56.12±1.78	998	50.65±1.41	998	67.55±4.04	998	53.10±1.73
Convex	61	57.65±2.33	61	53.04±1.85	61	80.84±5.29	61	55.20±2.27
Ear shape and orientation	NS		NS		NS		NS	
Erect	513	56.72±1.95	513	51.81±1.55	513	73.30±4.43	513	53.87±1.90
Droopy	546	57.05±1.96	546	51.63±1.80	546	75.09±4.46	546	54.42±1.91

Effects	Body length (cm)		Height at withers (cm)		Chest girth (cm)		Neck girth (cm)	
	n	Mean±SE	n	Mean±SE	n	Mean±SE	n	Mean±SE
Overall mean	1059	56.89±1.92	1059	51.84±1.53	1059	74.20±4.37	1059	54.15±1.87
Belly	NS		NS		NS		NS	
Flat	991	57.30±1.82	991	52.06±1.45	991	75.86±4.15	991	54.38±1.78
Pot	68	56.47±2.27	68	51.63±1.80	68	72.54±5.15	68	53.91±2.21
Top line	*		**		*		NS	
Straight back	603	57.79±1.95	603	52.66±1.55	603	75.94±4.43	603	54.77±1.90
Arched back	456	55.99±1.96	456	51.03±1.56	456	72.46±4.46	456	53.52±1.91
Wattles	NS		NS		NS		NS	
Present	32	55.82±2.62	32	50.48±2.08	32	72.96±5.95	32	52.59±2.55
Absent	1027	57.95±1.65	1027	53.21±1.31	1027	75.44±3.76	1027	55.70±1.61
Sex	NS		NS		**		NS	
Male	511	57.16±1.95	511	51.28±1.55	511	71.75±4.43	511	53.74±1.90
Female	548	56.61±1.96	548	52.41±1.56	548	76.64±4.46	548	54.55±1.91

Effects	Paunch girth (cm)		Teat number (nos)	
	n	Mean±SE	n	Mean±SE
Overall mean	1059	68.87±2.73	1059	9.92±0.07
Age	**		-	
0 – 1 month	76	19.47 ^d ±3.29	-	-
2 – 6 months	678	59.05 ^e ±2.67	-	-
7 – 9 months	130	80.61 ^b ±3.02	-	-
10 – 12 months	61	82.92 ^b ±3.40	-	-
Above 12 months	114	102.28 ^a ±2.99	-	-
Coat colour	NS		NS	
Black	892	71.31±2.07	892	9.87±0.05
Black with white	157	71.39±2.33	157	9.92±0.06
Black with brown	10	63.90±5.68	10	9.98±0.16
Head shape and orientation	*		NS	
Straight	998	66.68±2.52	998	9.93±0.07
Convex	61	71.06±3.30	61	9.92±0.09
Ear shape and orientation	NS		NS	
Erect	513	68.50±2.76	513	9.94±0.07
Droopy	546	69.23±2.78	546	9.91±0.07
Belly	NS		NS	
Flat	991	70.68±2.59	991	9.96±0.07
Pot	68	67.05±3.21	68	9.89±0.09
Top line	*		NS	
Straight back	603	69.90±2.77	603	9.92±0.07
Arched back	456	67.83±2.78	456	9.92±0.07
Wattles	NS		NS	
Present	32	65.74±3.71	32	10.00±0.10
Absent	1027	71.99±2.35	1027	9.85±0.06
Sex	**		NS	
Male	511	66.69±2.77	511	9.92±0.07
Female	548	71.04±2.78	548	9.93±0.07

** - Highly significant (P<0.01) * - Significant (P<0.05) NS – Non-significant
n = number of observations

CONCLUSION

Two distinct genetic groups were identified in the indigenous pigs of Tamil Nadu. There is a need for organized marketing channels for proper marketing and clean pork production from indigenous pigs. Effective conservation strategies have to be taken up to combat negative population trend. Indigenous pigs in Tamil Nadu have immense potential to contribute livelihood and sustainable pig farming in the country. These indigenous germplasm serves a valuable source of nutrient and provides food and nutritional security to the poor farming community. So, its characterization has to be taken care off by proposing for registration it as a new pig breed in the country through a recognised breed registration Committee (BRC), nodal agency like NBAGR. In this context, the phenotypic attributes are to given special attention. These morphometric attributes will be very useful in the selection of future breeding stock for future parent's generation and also as important steps towards *desi* pig breeds conservation measures in the country.

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