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Morphological characteristics of Moo Lat native pigs in Salavan Province, Lao PDR

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Abstract

This study assessed the morphological characteristics of Moo Lat Native pigs in Salavan district, Salavan province Lao PDR. A total of 60 pigs aged between 2 - 13 months (55% females and 45%) males were selected for the qualitative and the quantitative traits. The results of this study reveal that the Moo Lat native pig is black with white legs and on the forehead has a white spot. Its ears are directed forward and short, and its face is straight and long. The 60 pigs in the selected villages have mean measurements of 12.39 ± 6.64 kg body weight (BW);

44.26 ± 9.48 cm body length (BL); 50.94 ± 10.56 cm heart girth (HG); 36.41 ± 7.44 cm withers height (WH); 12.14 ± 2.92 cm ear length (EL); 16.55 ± 4.65 cm tail length (TL); and 10.37 ± 0.77 numbers of teats (NT). The pigs' BW is positively correlated with HG, BL, WH, TL, and EL, and heart girth was the best predictor ($R^2=0.91$) among those measurements with the highest degree of correlation and are positively correlated with HG, BL, WH, TL, and EL, and heart girth is a strong correlation.

Keywords: Moo Lat Native Pig, Morphological Traits, Measurements, Correlation

1. Introduction

Livestock raising is important socio-economically and culturally. This is because it is a source of livelihood and it provides food, and additional income. In 2020, there were approximately 1,234,000 buffalos; 2,188,000 cattle; 4,298,000 pigs; 682,000 goats; and 50,382,000 poultry in Laos [Food and Agriculture Organization Corporate Statistical Database (FAOSAT, 2020)]^[5] In Laos, raising livestock is essential. It offers food and nourishment as well as a means of subsistence. Pork is the second most popular meat consumed, with an estimated 12.2 kilogram consumed annually per person (FAOSAT, 2020)^[5]. In rural areas, native pigs play a significant role in the meat supply and contribute between 9-14 percent of the country's annual household income (Xayalath *et al.*, 2020)^[8].

Native pigs in Lao PDR are a valuable genetic resource that is continuously improved upon or displaced by highly productive and frequently imported varieties, which forces the localized indigenous pigs to become extinct. Salavan province was selected for this study because of its familiarity with pig production as depicted in it having the highest pig production in the country. The population of pigs continued to increase from 2008 to 2018 from 347,280 heads to 647,068 heads. The province also had the highest native pig meat production in the country at 16,789.37 tons in 2018 [Department of Livestock and Fisheries (DLF), 2018]^[3]. Moo Lat is the popularly raised breed at present, especially in the upland areas of Laos such as Luangprabang, Oudomxay, and Xaysomboun provinces. This type is also raised in some lowland territories like Salavan and Savannakhet provinces (Keonouchanh *et al.*, 2011)^[6]. Genetic and reproductive data and also the morphology of pigs are very crucial in pig breeding and also production for farmers. Although significant research has been done on the origins and genetic variety of pigs in Laos, However, in Salavan Province is limited and not properly documented. In order to assess and characterize the morphological appearances of the Moo Lat native pigs in Salavan Province, Lao PDR, this study was carried out.

2. Methodology

University of the Philippines Los Baños (UPLB) Animal Care and Use Committee approved all procedures (IACUC) with approved number 44110 PMES-OVCRE. In the Lao PDR, only one province was examined (Salavan province). This province was selected for this study because of its familiarity with pig production as depicted in it having the highest pig production in the country. The Salavan Province, having the highest pig production, was selected. In the province, it is Salavan District that has the largest population of pigs; thus, it was chosen for this study. From one township with the highest native pig population

in the district, the top four villages (Naxaynoy township, namely: Naxaynoy, Naxaynhai, Donkhao, and Learnsamphanh) with the largest number of native pig production in their respective area were selected (DLF, 2017) [2]. The 60 Moo Lat native pigs aged between 2 - 13 months (33 females and 27 males) in the selected villages were measured for their qualitative morphologic using the FAO (2012) method.

Quantitative include skin type, color, color pattern, hair, head shape, ear type, body shape, and type of backline. The methodology native pig measured were body weight (BW), body length (BL), heart girth (HG), withers height (WH), ear length (EL), tail length (TL), and the number of teats (NT). The pigs taken with those basic measurement aspects were chosen based on the following criteria: (1) The pig should be from 2 to 13 months old; (2) Its tail is not yet docked; (3) The female pig has not been impregnated before; and (4) The male pig is not yet castrated.

The Microsoft Excel program 2017 (Microsoft Corp., USA) was used for data analyses and generating tables. The Pearson correlation and regression were computed using all data and computed separately for males and females. All data analysis was conducted using the IBM SPSS Software version 20 (International Business Machines Corporation, USA).

3. Results and discussion

3.1 Number of Native Pigs Measured

A total of 60 Moo Lat native pigs were measured in the four villages under study. There were 33 (55%) females and 27 (45%) males. Age distribution is shown in Table 1, where

majority of pigs measured were between 3-5 months of age.

Table 1: Distribution of the measured pigs from four villages’ sex and age

Age groups	Naxanoy		Naxaynhai		Donkhao		Lernsamphanh		Total	
	M*	F*	M*	F*	M*	F*	M*	F*		
<3months	1	1	0	1	0	0	1	1	2	3
3-5months	3	3	4	4	4	3	5	5	16	15
6-8months	2	3	1	2	2	4	1	2	6	11
9-11months	0	1	1	1	1	1	0	0	2	3
12months above	1	0	0	1	0	0	0	0	1	1
Total	7	8	6	9	7	8	7	8	27	33

M* = male; F* = Female

3.2 Characteristic appearances of Moo Lat Native Pigs

In this study, the characteristic appearances of Moo Lat in the selected villages were observed (Table 2). It was found that all of the pigs have smooth skin and straight hair. Majority of the pigs observed (98%) are black, while only a few (2%) are brown. All Moo Lat pigs have white feet (from half portion of the lower knee, down to the hoofs) or “socks”, 46% of those observed are black with white belly, 37% are solid black with black belly, and 17% are black with white spots on the belly. Majority of the pigs observed (92%) have long snout and only a few (8%) have dish-like face. On ear types, majority of the Moo Lat pigs have erected ears (98%) and few (2%) have droopy ears. Most of the pigs (72%) have long bodies; some of them (23%) have short bodies, and remaining few (5%) have barrel-like body shape. Majority of these pigs observed (92%) are swayback and a few of them (8%) have straight a back line (Fig 1).



Fig 1: Native breed (Moo Lat type) of (a) and (b)

The present study shows the Moo Lat have distinct characteristics which would easily differentiate it from other native pigs in Laos (Table 2). It is similar with what

(Keonouchanh *et al.*, 2011) [6] stated that native pigs in Laos of have short and forward directed ears, straight face, black skin, white legs, and white spotted forehead.

Table 2: Characteristic appearance of Moo Lat native pig in selected villages under study

TRAITS	TYPES	FREQUENCY	PERCENTAGE
Skin	Smooth	60	100
Total		60	100
Hair	Straight	60	100
Total		60	100
Prominent color	Black	59	98
	Brown	1	2
Total		60	100
Color pattern (all with socks)	Black with spotted white belly	10	17
	Solid black, black belly	22	37
	Black with white belly	28	46
Total		60	100
Face shape	Long snout	55	92
	Disk-like	5	8
Total		60	100
Ears	Erect	59	98
	Droopy	1	2
Total		60	100
Body shape	Barrel like	3	5
	Long	43	72
	Short	14	23
Total		60	100
Backline	Straight	5	8
	Swayback	55	92
Total		60	100

3.3 Body weight and size measurements of the Moo Lat Native Pigs

Table 3 presents the morphology of the 60 Moo Lat native pigs in the selected four villages. The body weight of the females is relatively 1 kg heavier than males, but considering that the females in this study are older than the males on average by 1 week. Their body size measurements reveal that the males and the females are of the same size. Their number of teats is lower compared to exotic purebreds that have 12 teats.

Table 3: Measurement of native pig in the selected villages under study

PARAMETERS	MALE		FEMALE		OVERALL	
	Mean	SD	Mean	SD	Mean	SD
Age (months)	5.76	2.61	6.02	2.34	5.90	2.45
Body weight (BW), (kg)	11.81	6.90	12.86	6.60	12.39	6.70
Body Length (BL), (cm)	42.75	9.80	45.50	9.33	44.26	9.56
Heart girth (GH), (cm)	49.50	11.04	52.11	10.33	50.94	10.65
Withers Height (WH), (cm)	36.16	7.53	36.61	7.58	36.41	7.50
Ear length (EL), (cm)	11.91	2.22	12.33	3.44	12.14	2.94
Tail length (TL), (cm)	15.56	4.41	17.35	4.83	16.55	4.69
Number of teat (NT),(teats)	10.59	0.93	10.18	0.58	10.37	0.78

Bivariate correlation analysis shows the relationships between body weight and body measurements (Table 4) of Moo Lat native pigs. The average body weight of males and females is 11.81 kg and 12.86 kg, respectively. All body measurements were highly positive correlated ($r \geq 0.70$; $P < 0.01$) with each other. Heart girth has the highest degree of correlation ($r=0.96$) with BW, followed by WH, BL and TL, and EL. Using data of all pigs, ear length had moderate correlation with other body measurements and body weight. Number of teats did not establish a correlation with BW, HG, WH, and EL, but had weak negative correlation with

BL ($r = 0.35$, $P < 0.01$) and also very weak negative correlation with TL ($r = .29$, $P < 0.05$).

Table 4: Correlation of traits in Moo Lat native pigs

Traits	BL	GH	WH	EL	TL	NT
BW	.89**	.96**	.87**	.70**	.81**	-.19 ^{ns}
BL		.91**	.91**	.73**	.85**	-.35**
HG			.93**	.75**	.89**	-.25 ^{ns}
WH				.79**	.89**	-.23 ^{ns}
EL					.77**	-.03 ^{ns}
TL						-.29*

** Correlation is significant ($P < 0.01$)

* Correlation is significant ($P < 0.05$)

^{ns} Not significant

Similar to this, Paras and Cu-Cordoves' (2014) [7] research revealed that there was the strongest correlation between body weight and heart girth ($r=0.94$). In rural and peri-urban locations, selection for body weight is likely to have a correlated response with these traits in native and crossbred pigs (Adealoa *et al.*, 2013) [1].

Knowing the body weight of native pigs is important in Salavan province especially when selling or medicating the animal, the present study further described the relationship of body weight with other body measurements and teat number separately for males and females (Table 5). It could be seen that heart girth is very strongly and positively correlated with body weight in males and females, which confirms what was previously discussed above using all data.

Table 5: Correlation body weight with body measurements in Moo Lat native pigs

Item	Correlation coefficient (r)		
	Actual body weight		
	Male	Female	All
Body measurement, cm			
Body Length	.91**	.87**	.89**
Heart Girth	.94**	.97**	.96**
Withers Height	.85**	.89**	.87**
Ear length	.64**	.76**	.70**
Tail Length	.79**	.82**	.81**
Number of Teats	-.09 ^{ns}	-.30 ^{ns}	-.19 ^{ns}

** Correlation is significant ($P < 0.01$)

^{ns} Not significant

The pigs' BW is positively correlated with HG, BL, WH, TL, and EL and using single regression to predict body weight of Moo Lat native pigs (regardless of sex), heart girth was the best predictor ($R^2=0.91$) when compared with other body measurements (Prediction equation, BW, kg = -18.25 + 0.60 x Heart girth, cm) (Table 6). In this study, tail length and ear length had the lowest R^2 , and therefore may not be highly recommended to estimate body weight of Moo Lat native pigs weighing between 2.5-36 kg. Categorizing the data on body weight and body measurements per sex, heart girth was still the best predictor of body weight in males and females, with R^2 of 0.88 and 0.94, respectively.

Table 6: Prediction equations to estimate body weight of Moo Lat native pigs between 2.5 - 36 kg

Prediction equation	R ²	P-value
Using all data of males and females (n=60)		
BW, kg = - 15.23 + 0.63 x Body length, cm	0.80	P<0.01
BW, kg = -18.25 + 0.60 x Heart girth, cm	0.91	P<0.01
BW, kg = -15.91 + 0.78 x Withers height, cm	0.76	P<0.01
BW, kg = -6.66 + 1.15 x Tail length, cm	0.65	P<0.01
BW, kg = -6.94 + 1.59 x Ear length, cm	0.49	P<0.01
Using data of males only (n=27)		
BW, kg = - 15.72 + 0.64 x Body length, cm	0.84	P<0.01
BW, kg = -17.24 + 0.59 x Heart girth, cm	0.88	P<0.01
BW, kg = -16.32 + 0.78 x Withers height, cm	0.72	P<0.01
BW, kg = -7.51 + 1.24 x Tail length, cm	0.63	P<0.01
BW, kg = -11.94 + 1.99 x Ear length, cm	0.41	P<0.01
Using data of females only (n=33)		
BW, kg = - 15.25 + 0.62 x Body length, cm	0.76	P<0.01
BW, kg = -19.50 + 0.62 x Heart girth, cm	0.94	P<0.01
BW, kg = -15.49 + 0.77 x Withers height, cm	0.79	P<0.01
BW, kg = -6.68 + 1.13 x Tail length, cm	0.68	P<0.01
BW, kg = -5.00 + 1.45 x Ear length, cm	0.57	P<0.01

4. Conclusions and recommendations

Characteristic appearances of Moo Lat Native Pig in the selected villages observed that all of the pigs have smooth skin and straight hair and black in body, but they have white feet (from half portion of the lower knee, down to the hoofs and some pigs are black with a white belly, and they have erect ears and swayback. As the female pigs have higher physical measurements than the male pigs, it reflects that the farmers prioritize nurturing the female pigs due to their reproductive ability. Male and female average body weights are 11.81 kg and 12.86 kg, respectively. When compared to other body parameters, heart girth was the best predictor (R²=0.91) because BW is positively correlated with HG, BL, WH, TL, and EL.

This suggested follow-up study should focus on physical appearance including measurement of body weight, heart girth, body length, withers height, and teats to validate whether the pigs are native pigs or not. The proper identification of the genotype of pigs in the study sites will bring about a breeding program. It is suggested that Lao future researchers should focus their studies on native pigs in Laos, especially in the other districts and other regions in the country that have potential native pig farming. Future studies should focus on cost-benefit analysis, feasibility of feed resources adapted with technology, and proper management methods.

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