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Phenotypic Characterization and Production Performance of Village Pigs in Sri Lanka

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ABSTRACT. *Village pigs are considered as a valuable component in rural farming systems, especially in the Western coastal area of Sri Lanka. This population is considered stagnated due to the absence of a comprehensive improvement and conservation strategy. The objectives of the study were to evaluate the phenotypic and production attributes and present management and utilization status of these pigs. A total of 60 randomly selected swine farms rearing village pigs in Kalutara, Puttalam, Kurunegala and Chilaw were used for the study. Morphological traits and reproductive performance were measured in males and females separately. A pre-tested questionnaire was used to obtain socio-economic and management information. Thirty nine percent of the farmers had kept crossbreds with village pigs and others had only village pigs. The predominant coat color of the village pigs was black with 85% of them having some skin pigmentations. Mean adult body weight was 50.62±1.92 kg for males and 44.00±3.47 kg for females. The majority of them had erect ears (7 %) with upward or horizontal orientation, while 72 % had narrow straight tails. The village pigs with stocky body shape showed higher girth, height at withers and body length than animals with angular body shape while length and width of head, pairs of teats and tail length were not significantly different (P>0.05) between the two types of body shapes. The mean litter size was 6.4±1.19. The mean days at first farrowing and the farrowing interval were 292±78.3 and 265±74.7 days, respectively. The gestation length recorded in the present study varied between 100 and 115 days. There was no significant difference (P>0.05) in reproductive parameters of the individuals found in the four geographical areas except for the age at first farrowing and farrowing interval. Village pigs were reared predominantly under extensive management systems with occasional tethering. Farmers exhibited limited knowledge on pig farming and improved management though they are reared mainly for commercial purposes. Easy management, low cost of production and disease tolerance were the main advantages of village pig farming over other livestock enterprises.*

INTRODUCTION

The total swine population in Sri Lanka is estimated to be 91,977 heads, producing about 14,000 metric tons of pork annually. Average per capita pork consumption is 0.6 kg per year, which is about $1/10^{th}$ of the total meat consumption by an average Sri Lankan (DAPH, 2006). About 60% of the present swine population is made of village pigs. This kind of swine population is widely distributed along the Western coastal Belt of Sri Lanka as back yard scavengers. Village pigs are popular for their quality and tasty meat in Sri Lanka. However, there is no planned breeding program for those pigs in the country and as a result the village pig population is decreasing gradually. Despite decreasing trends in populations the native types still represent a valuable component of local genetic resources.

Several attempts were made in the recent past to evaluate and compare growth and reproduction parameters of village, wild type pigs and exotic pigs (Dematawewa *et al.*, 1999, Goonewardena *et al.*, 1984, Sahaayaruban *et al*., 1984, Silva *et al.*, 1999; 2004). However, there has been no thorough investigation carried out to characterize or to evaluate the performance of village pigs in spite of the fact that they continue to thrive under poor management in a harsh climate. A scientific knowledge base on the farming conditions of village 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. In this context, a study was formulated to evaluate the phenotypic and production attributes and management and utilization of village pigs in Sri Lanka.

MATERIALS AND METHODS

The study consisted of two phases: a field level investigation on morphological and reproductive traits of pigs and farming system and a set of laboratory investigations on molecular characterization of village pigs found in four different locations. This paper presents the methodology adopted for the field survey and the relevant results. The field level investigations were aimed at collecting information on morphological and reproductive parameters of village pigs at different locations in Sri Lanka. Based on the preliminary investigation, four locations (districts) were included in the study: Kalutara, Kurunegala, Puttalam and Chilaw. Information on management systems including breeding, availability of resources and facilities, level of production, socio- economics and geographic characteristics of swine farms was collected using a pre-tested structured questionnaire. Sixty unrelated village pig farms equally distributed in four locations were sampled from independent farm holdings. The survey had to be limited to sixty farms due to the limited availability of farms having pure village pigs. The types of morphological characters observed and measured are given in Table 1. All data gathered from the questionnaire survey were coded and entered in Excel spreadsheets (MS EXCEL-2007) and analyzed using Statistical Analysis software (SAS 9.1).

Table 1. Morphological traits observed and measured in survey

Descriptive traits	Coat colour, Skin pigmentation, Head shape, Ear direction, Ear size, Ear orientation, Tail shape, Body shape
Morphometric traits	Hair length, Tail length, Number of teats, Girth size, Length of head, Height at withers, Body length, Width of head

RESULTS AND DISCUSSION

Morphological traits

Coat characteristics

According to the present study, the common coat color of village pigs is black with a change of color from young stage (greyish brown) to adult stage. The coat colour has been recorded as light brown to black or grey to black in two previous studies (Ravindran *et al*., 1984 and Pathirajah, 1986). Most of the village pigs in the study areas had skin pigmentation (85%). The spotted skin is a negative characteristic associated with village pigs in a commercial sense as the skin is also consumed as part of the carcass. In general, consumers show low

preference for meat with dark pigmentation. About 97% of the village pigs were found to have hairs of medium length (1.5 to 2.0 cm) while the rest had longer hairs (more than 2 cm). In general, the skin of the village pigs was fully covered with medium size hairs.

Head and ear characteristics

The shape of the head was long straight in most of the village pigs (88%) and the rest had a shape classified as wide face. A previous by Sahaayaruban *et al.*, (1983) reported that the Sri Lankan village pigs have short, erect ears pointed backwards. However, the present study showed that village pigs can be found with drooping ears as well while the majority (77%) had erect ears. The erect ears showed either upward or horizontal orientation. With respect to the size of the ear, most of the village pigs (88%) had medium size ears (7 to 9 cm).

Body and tail shapes

Village pigs were found to have either stocky or angular body shapes where about 84% of them belonged to stocky body type. Curled as well as straight tails could be noticed among the village pigs. Seventy two percent of the pigs had a straight tail. The curled tails were generally thin and showed an upward curl forming one circle. One fourth of the total tail length is composed of the tail switch.

Number of teats

Variation in number of teats among pigs is also a widely used criterion in morphological diversity studies. The number of teats that the female village pig bears ranged between 6 and 7 pairs with a Mean of 6.71±0.46. These findings agree with the observations made by Cheng (1984) on Kele indigenous pigs found in Southwestern China and by Lemus-Flores *et al*., (2001) on Mexican native pigs. Among the Sri Lankan village pigs, those with 7 pairs of teats were observed to be most common (68%), compared to those with 6 pairs of teats.

Body measurements

Body measurements of male and female village pigs (Table 2) showed that the males tend to have bigger body conformation than the females except for the height at withers. The weights of mature village pigs varied from 44 kg to 60 kg. The overall mean weights for the adult male and female village pigs were 50.62±1.92 kg and 44±3.47kg respectively. Pathiraja, (1986) reported much larger adult female and male body weights (60 kg and 70 kg, respectively) in their investigation of a cross breeding program between village pigs and exotic pigs under intensive management conditions. However, the present study failed to record a significant difference ($P>0.05$) between the two sexes except for tail length. Larger error variations leading to lack of significance among otherwise largely different means are common in field survey findings. Sudhakar and Gaur (2006) also found that effect of sex was not significant on all body weights and measurements in Indian indigenous pigs except for weight at birth. Similarly girth size, body length, height at withers, length of head and width of head did not differ significantly ($P>0.05$) between the two sexes.

Table 2. Linear body measurements of village pigs (mean ± S.E.)

Body measurements	Male	Female
Body weight	50.62 ± 1.92	44.00 ± 3.47
Girth size (cm)	75.14 ± 2.43	73.66 ± 3.17
Height at withers (cm)	48.59 ± 3.88	50.77 ± 4.01
Body length (cm)	75.10 ± 1.87	69.95 ± 2.43
Length of head (cm)	25.04 ± 0.91	23.57 ± 0.99
Width of head (cm)	12.54 ± 0.53	12.14 ± 0.61
Pair of teats	--	6.71 ± 0.46
Tail length (cm)	28.47 ± 4.03	27.94 ± 4.74

Morphometric comparisons carried out between village pigs with stocky body shapes and angular shapes showed that the ones with stocky body shape showed significantly higher girth size, height at withers and body length than animals with angular body shape ($P<0.05$). The length and width of head, pairs of teats and tail length were not significantly different ($P>0.05$) between the two types of body shapes (Table 3). Most of the animals with stocky body shape had concave shape of head, straight tail and erect ears with upward orientation.

Table 3. Comparison of morphometric measurements of village pigs with stocky and angular body shapes*.

Body measurements	Stocky body (Mean±SD)	Angular body (Mean±SD)
Girth size (cm)	71.36 ± 10.09	52.77 ± 5.65
Height at wither (cm)	42.89 ± 6.43	30.27 ± 1.50
Body length (cm)	84.48 ± 7.57	58.33 ± 2.50
Length of head (cm)	27.58 ± 7.57	23.75 ± 1.53
Width of head (cm)	17.52 ± 2.80	13.05 ± 0.91
Pairs of teats	6.72 ± 0.57	6.83 ± 0.75
Tail length (cm)	26.47 ± 6.03	27.88 ± 5.60

Reproductive performance

The average litter size of village pigs was 6.44±1.19 (Table 4) and it is comparable to the observations made by Sahaayaruban *et al*., (1983) and Goonewardena *et al*., (1984) on Sri Lankan village pigs reared under intensive conditions. The mean litter size of Sri Lankan village pigs was higher than that of Nigerian native pigs (Adebambo, 1982) and lower than that of Taiwanese pigs, Tanzanian native pigs, Zimbabwean native pigs (Chiduwa *et al.*, 2008) and local Chinese pigs (Lee *et al*., 1983) which reported values ranging from 6.6 to 7.9 piglets.

Table 4. Mean performances for different reproductive traits of village pigs

Parameters	**Mean ± SE**
Age at first farrowing (months)	9.50±2.61
Farrowing interval (months)	8.91±2.49
Litter size (piglings/furrowing)	6.44±1.19
Gestation period (months	3.21±0.21

The average age at first farrowing was 292 days, which is comparable with the value (298 days) reported previously by Goonewardena *et al.*, (1984) for Sri Lankan village pigs. However, this is a shorter period compared to age at first farrowing values of 319-417 days reported for other pig breeds including indigenous pigs by Chapman *et al.*, (1978) and Stasiak *et al.*, (2006). The farrowing interval recorded in the present study was 265days in village pigs and this is relatively a higher value than the value reported by Goonewardene *et al*., in 1984 (216 days) for intensively reared Sri Lankan village pigs and by Sudhakar and Gaur in 2006 (188-200 days) for Indian pigs in the eastern region. The traditional practice of Sri Lankan pig keepers is to leave piglets to suckle without restriction until they wean themselves. This might have contributed to the delayed heat and invariably have caused the long farrowing intervals. Gestation length recorded in the present study ranged from 100 to 115 days. This value is comparable with the observations made by Sahaayaruban *et al.*, (1983), who reported the gestation length to vary from 108 to 118 days.

Table 5. Mean performances for different reproductive traits of village pigs at different locations (± standard error)*

Location	Age at first farrowing (months)	Farrowing interval (months)	Gestation period (months)	Litter size (months)
Kulutara	8.62 ± 0.16^{a}	6.75 ± 0.22^{a}	3.18 ± 0.26^{a}	5.37 ± 0.10^{a}
Kurunegala	9.66 ± 0.23^{b}	9.33 ± 0.31^{b}	3.33 ± 0.35^{a}	6.00 ± 0.15^{a}
Chilaw	8.44 ± 0.48^{c}	9.66 ± 0.64^{c}	3.27 ± 0.36^{a}	5.88 ± 0.30^{a}
Puttalam	8.08 ± 0.66^{d}	8.33 ± 0.27^{d}	3.33 ± 0.35^{a}	6.16 ± 0.83^{a}

*Means within columns with different superscripts are significantly different ($P<0.05$)

There was no significant difference ($P>0.05$) in litter size and gestation period among the four districts. However, age at first farrowing and farrowing interval were significantly different ($P<0.05$) among the four locations (Table 5). The lowest values for farrowing interval and age at first farrowing were reported in village pigs in Kalutara. The village pigs in Kalutara were kept only under extensive (scavenging) system (Table 6), whereas in other districts both extensive and semi-intensive systems are practiced. Thus, apparent diversity of feed resource base was high in Kalutara. In the present study, it was observed that the management conditions of semi-intensive system of rearing was poorer compared to those of extensive system of rearing, where the conditions were moderate. This may have favoured the village pigs for recording low farrowing intervals in Kalutara. However, litter size seems slightly lower in Kalutara area (though not significant) as pigs are exposed to adverse environmental conditions under extensive management systems.

Socio-economic role of village pigs

According to the survey data, most of the village pig farmers were male (74%) with the average of 8.7 years of experience in farming. However, women also showed great responsibilities such as providing feed, cleaning of shed and looking after the animals in pig management. The low number of young farmers participating in pig farming is a concern since they are the farmers of the future who would ensure the sustainability of village pig farming. Religious background also influences the choice of livestock. Most of the village pig farmers were Christians (61%) and rest were Buddhists. No Hindus or Muslims were found to be involved in pig farming indicating the religious taboos with respect to meat consumption among them. Dematawewa *et al.,* (2009) also reported that Hindus were rarely involved in swine farming while no Muslims were involved at all.

In general, village pigs were kept under traditional management systems characterized by low inputs coupled with poor management conditions. The majority of farmers who keep village pigs were involved in crop cultivation (45%) or fishing (34%) (Fig. 1). Almost all the village pig farmers in Kalutara were involved in fishing while all in Kurunegala were involved in crop production indicating that available resources of the area is the deciding factor in selecting the component of mixed farming system. These observations are comparable to the remarks made by Chiduwa *et al.,* (2008) on village pig management systems reported in different regions of the world. The survey results also suggest that the majority of the farmers own other livestock species such as cattle, chicken and goats. This will diversify the income base and will also provide insurance against droughts and other natural catastrophes. This therefore, reflects that farmers have with a wide resource base which ensures the sustainability of the production system.

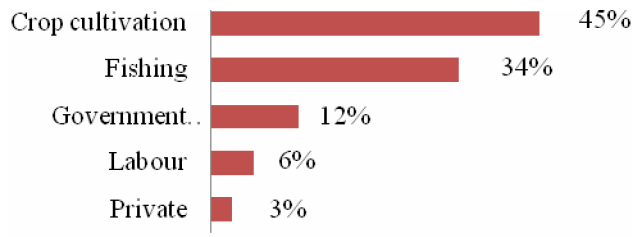

Figure 1. Occupation of village pig farmers

As far as the total family income is considered, village pig farming was considered as a secondary income source in most households. However, sale of village pigs is the main source of income for about 10% of the total farm holdings, located mainly in the Kalutara district. On average, 45% of the total family income was from the salary or wages from other sources of employment, whereas 34% was contributed by village pig farming. Sale of animals was the major income generating component in village pig farming.

Management systems

Village pigs were found to be reared in either an extensive or a semi-intensive management system. Description of management systems and the respective frequency of occurrence in different survey areas are shown in Table 6. Extensive system of rearing was the most common system (77%) found in these study areas. Cambodia, Tanzania, Phillipines and Vietnam also use predominantly extensive system for rearing village pigs (Chiduwa *et al*.,

2008). However, in Thailand 80% of the native pig production is based on intensive management (Ranald, 2000).

Table 6. Description of management systems in different survey areas

System	Description	Areas	%
Extensive system	• No housing • Free movement of animals • Large land area • Little inputs • Predominantly waste feeding	Kalutara Kurunegala Puttalam Chilaw	61 8 7 2
Semi intensive system	• Limited movements of animals • Supply of the total feed requirements • Permanent housing system	Puttalam Kurunegala Chilaw	12 7 4

The management conditions were found to be moderate (good sanitation and shade with inadequate level of feed) in general under extensive system (Table 7). It was interesting to note that good management conditions could not be observed in either of the management systems. Further, the majority of semi-intensively managed farms exhibited poor management conditions (improper housing, inadequate feeding, water supply and sanitation). This observation signifies that village pigs are better looked after under extensive system of rearing compared to semi-intensive system of rearing. The present study further revealed that scavenging was the common method (60%) of feeding under extensive management system, especially in Kalutara area.

Table 7. Management conditions at different rearing systems

Management condition	Management system	
	Extensive	Semi-intensive
Good	0 %	0 %
Moderate	88 %	23 %
Poor	12%	77 %

Other methods such as tethering under coconut, rearing in concrete pens and rearing in simple huts with coconut thatch (semi-intensive system) were also observed in some farms. When animals are in confinement, it limits the opportunity of animals for scavenging a variety of feed materials to fulfill their requirements as the supplementation is normally minimal or absent (Moyo and Mpofu, 1999).

Nutrition

Swill, rice polish and coconut poonac were the main components of pig feeds in most of the areas. According to the survey, the feed availability was moderate in most of the cases (Table 8). The majority of farmers do not provide feed additives due to lack of availability (52%) (Table 8). However, few farmers (7%) give mineral mixture and vitamins to village pigs.

Table 8. Availability of feed and feed additives in village pig farming

	Adequate		**Moderate**		**Inadequate**	
	Description	***%***	***Description***	***%***	***Description***	***%***
Availability of feed	Nutritious feed Available all the time	23	Less nutritious feed available all the time	53	Limited availability of nutritious feed	24
Availability of feed additives	Available at reasonable prices	24	Available but expensive	24	Not available	52

Other facilities

The facilities available for village pig farming were evaluated according to the farmer's perception. The availability (efficient) or unavailability (inefficient) of facilities on time was evaluated in all four study areas as shown in Table 9. In the survey areas 46% of village pig farmers said that they had efficient veterinary services and 42% of the farmers were reported to have adequate extension facilities (Table 9). However, majority of the farmers do not seek any advice on village pig management and production despite the fact that the government of Sri Lanka provides these facilities free of charge to farmers through trained extension personnel who reside within the farmers' locality.

Table 9. Facilities available for village pig farmers

Facilities	Efficient[1]	Inefficient[2]
Veterinary facilities	46%	54%
Extension services	42%	58%
Marketing	100%	0%

[1]The facility is available on time
[2]The facility is not available

Marketing facilities were well organized in the survey areas. Live animals were sold mainly through village collectors (69%). Some farmers sell the animals directly to the consumers at their farm sheds. There were 2-3 collectors on average in a village. Retail outlets and road-side huts were the major sales points (Fig. 2). The price of a kilogram of live animal varied between Rs 170.00 and 325.00. This variation depends highly on availability of village pigs in the area and the predominant ethnic group in the area. For example, demand for pork is relatively high in predominantly Christian communities.

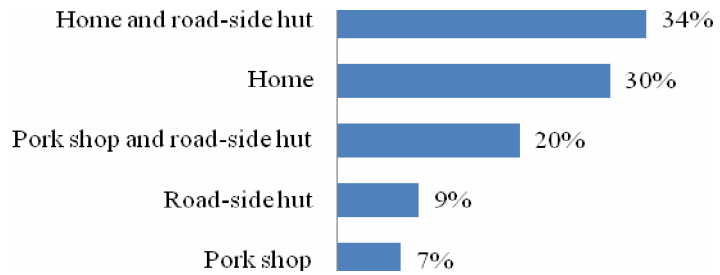

Figure 2. Place of sale

Herd size

Majority of the farmers (47%) had 1-5 village pigs in their herds and majority of pig keepers tend to keep all categories of pigs (adult males, adult females, young boars, heifers and piglets) in one herd. Essentially, the majority of village pig farms in Sri Lanka fall into the small farm category according to the herd size. Small indigenous pig herds (3-9) were also commonly reported in other countries as well (Kofoworola, 2007; Chiduwa *et al*., 2008). There were only few farms (8%) with more than 20 village pigs. These farms were found mainly in Kalutara. As pointed out by Kofoworola (2007) the size of village pig herds is influenced by several factors such as size of the household, level of investment, level of income generated by pig farming and pig keeping experience. Accordingly, the large herd size observed in Kalutara district could be justifiable given the socio-economic characteristics of pig producers in the area.

Around 39% of farmers were found keeping few crossbred pigs with village pigs. As reported by Senyatso and Masilo (1996) and Nsoso and Morake (1999) cross breeding has some negative effects for communal farmers for a number of reasons. The foremost reason being that communal areas are not fenced and as a result animals are free to mix, hence mating is not controlled. Under these circumstances cross breeding would not benefit farmers since it needs to be directional to become beneficial. Crossbreds may not be the best choice under the scavenging system compared to pure indigenous, which is well adapted to be raised under the scavenging system. However, the present study showed that there was no planned breeding program among village pig farms in the four locations. Village pigs cross among themselves or with wild type pigs when village pigs are scavenging along the neighboring forest.

Disease and mortality among village pigs

No records were maintained in all areas studied and most farmers do not have any information on pig diseases. However, the disease incidences reported were fairly low even though the majority of pigs were reared under harsh conditions. This would testify the disease resistance of village pigs to a certain extent. General weakness and loss of appetite were indicated as common problems by the respondents. According to the farmers, pre-weaning mortality of piglings was 20%. Trampling was the major cause of mortality among the piglets before weaning. However, it was observed that less attention given to feeding and disease control might have predisposed pigs to other problems such as poor growth and general weakness.

Reasons of rearing village pigs

As indicated in Fig. 3, the reasons for keeping village pigs were diverse, while the predominant reasons were easy management, low disease incidences and cost effectiveness. These observations are however contradictory to the reports of some other Asian countries like Cambodia, where village pig keeping is not very attractive due to high cost of feeding and also the fluctuation of price per unit live weight (Sovann *et al*., 2002). However, in Tanzania, Vietnam and Southern Botswana native pig farming is very attractive as they served as the family bank as well as a source of valuable fertilizer for paddy and vegetable plots (Renald, 2000).

The reasons for favoring village pig farming indicated by Sri Lankan farmers provide a path for sustainable utilization of the native pig genetic resource. However, village pig production

system in Sri Lanka needs further attention and guidance by the relevant authorities to avoid undesirable breeding strategies that farmers adopt such as cross breeding.

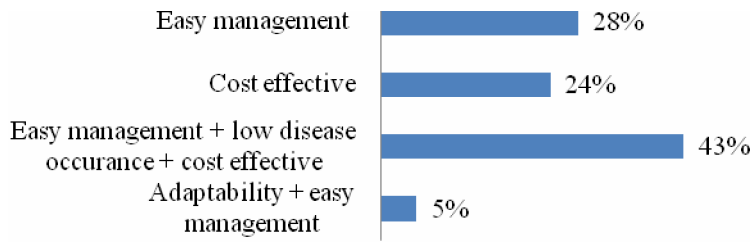

Figure 3. Reasons for rearing village pigs

CONCLUSION

Village pigs are reared mainly under a resource-driven management system with commercial objectives. Though the native pigs are of little value for commercial pork production, they will remain valuable as sources of meat and secondary income to the rural household economy in Sri Lanka. The hardiness and adaptability to harsh management conditions seem to compensate for their low productivity. Village pigs in Sri Lanka show diverse morphology except for coat color. Having considered the positive and favorable characteristics of village pigs, it is obvious that there is a huge potential to improve the village pigs genetically to exploit the real contribution it could make to the local pig industry.

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