

Doe productivity of Kacang and Peranakan Etawah goats in Indonesia and factors affecting them

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Abstract

The evaluation of the reproductive performance of a local and adapted breed of goats can provide important information to understand its productive potential using local resources. Goats are important for a large part of the Indonesian rural population.

Indonesia is situated roughly between 6° to 11° north latitudes and 95° and 141° east longitudes. The temperature stays within a constant range of 23-31°C daily in the low plains and 18-27°C in the inferior plateau.

The major breeds of goats in Indonesia are the Kacang and Peranakan Etawah goat. Kacang is an indigenous breed of goat found in Indonesia. Peranakan Etawah goats descend from crossings between the Kacang with Etawah (from India) goats. The level of reproductive performance is dependent on the interaction of genetic and environmental factors, and has to be given priority. This paper provides basic statistics' information on reproductive performance of female Kacang and Peranakan Etawah goats in Indonesia.

Reproduction data of approximately 280 Peranakan Etawah and 200 Kacang goat does were collected through on-farm research and monitoring studies over 1.5 years in smallholder agriculture located in Central Java, Indonesia. At every reproductive event, the date and number of the animals concerned were recorded. Data was analysed using descriptive statistics (SYSTAT Inc., 1992).

The results for Kacang and Peranakan Etawah goats revealed that they breed aseasonally. The litter size ranged between 1 and 3 kids for all does, the average litter size of Kacang and Peranakan Etawah goats was 2.06 and 1.56 kids, respectively. Litter weight at birth of Kacang and Peranakan Etawah goats was 3.8 and 5.4 kg, respectively. Survival rate till weaning of Kacang and Peranakan Etawah goats was 97 and 92%, respectively. Kidding interval of goats ranged from a minimum of 205 in the Kacang goat to a maximum of 450 days in the Peranakan Etawah. Doe reproduction index of Kacang and Peranakan Etawah goats was 3.07 and 1.65 kids/doe/year.

Key words: Goat production; Goat reproduction Kacang goat; Peranakan Etawah goat; Indonesia

Introduction

Indonesia is situated roughly between 6° to 11° north latitudes and 95° and 141° east longitudes. The temperature in Indonesia stays within a constant range, differing only a few degrees between the hot and cool months: 23-31°C daily in the low plains and 18-27°C in the inferior plateau.

Small ruminant production systems in South and Southeast Asia have endured in relation to the overall pattern of crop production and farming systems (Pashaa and Saithanoob, 2000). Goats are important for a larger part of the Indonesian rural population (Sabrani and Knipcheer, 1982). Animals are kept as an important component of farming activities, particularly by smallholders. Nearly ninety nine percent of small ruminants in Indonesia are found in the hands of smallholders. This fact indicates an important role for smallholders (Soedjana, 1993). Goats in Indonesia play a complex function in Indonesia's farming systems. Their biological and economic function have long been recognized. Besides producing animal products, they also provide manure to maintain soil fertility (Suradisastra, 1993). The contribution of goats within the total farming income for small goat keepers is substantial (Sabrani and Siregar, 1981).

Goats in Indonesia are kept primarily for meat production, so production traits of interest are the number of young weaned per breeding female per year and their growth rate (Bradford, 1993). The number of goats raised per farm is relatively small (Soedjana, 1993), about two to ten heads (Sodiq et al., 2001). The two common productive systems for small ruminants in Indonesia are (1) cut and carry, where forage and other feeds are brought to continuously housed animals (Sodiq et al., 1998; 2000); and (2) grazing under tree crops, along roadsides, in temporarily idle croplands, etc. (Bradford, 1993). Housing of animals has traditionally been part of the goat production system in the humid tropics. Most animal houses have open sides for better ventilation to remove heat and humidity (Chaniago, 1993).

The majority of goats in Indonesia are concentrated in the Island of Java (DGLS, 1999). The major breeds of goats in Indonesia are the Kacang and Peranakan Etawah goat (Edey, 1983). Kacang is a local (indigenous) breed of goat found in Indonesia. It is called locally 'Kambing Kacang'. Kacang goats are relatively small with a compact body frame, have erect ears and short horns in both sexes. Peranakan Etawah goats descended from crossings between the Kacang with Etawah (Jamnapari) goats. Generally known simply as PE goat, animals of this population are distinctly different from the Kacang goats. They have a larger body frame, long hanging ears, a convex face and larger horns.

Reproductive performance is one of the main determinants of productivity of goats. This applies to the breeding of animals for meat production (O'Shea, 1993). High reproduction rates are essential for profit in goat meat production (Ezekwe and Lovin, 1996). The level of reproductive performance is dependent on the interaction of genetic and environmental factors (Greyling, 2000) and has to be given priority (Barding et al., 2000).

Reproductive efficiency as such can be measured and expressed as the kidding rate, weaning rate, kidding interval, live weight of kids born or weaned and the length of the reproductive cycle (Greyling, 1988). By far the most important factors affecting offtake rates is the number of young weaned per female per year (Bradford, 1993). Because Indonesia is close to the Equator, Indonesian breeds appear to be completely non-seasonal (Bradford, 1993). There is strong evidence from recent studies that indigenous Indonesian breeds do not display any breeding season but breed with equal efficiency at all months of the year (Lindsay et al., 1982). The low latitudes between the Tropics are characterised by small annual day length variation, high but regular annual rainfall, high humidity and high temperatures. These factors may be expected to contribute to annual variation in reproductive activity. High mortality of young stock and poor reproductive efficiency of does are major causes of low productivity in many production systems.

2 Purposes of the study

The purposes of the study are:

To find out the production and reproduction level of Kacang and Peranakan Etawah goats under the Village Production System. For the doe: litter size, litter weight at birth, kidding difficulties, litter weight at weaning, survival rate till weaning, kidding interval, doe reproduction index and doe productivity index. For the kid: birth weight, kid growth until weaning, weaning weight, condition scoring and leg conformation.

To identify some factors affecting the production and reproduction level of Kacang and Peranakan Etawah goats under the Village Production System, there are some factors to be examined in this study: parity, type of birth, sex, litter weight at birth, litter weight at weaning and birth weight.

This paper provides basic statistics' information on breeding time and the age at first time breeding, type of birth, litter weight at birth, survival rates, kidding interval, and also doe reproduction index of Kacang and Peranakan Etawah goats under Village Production System in Indonesia.

3 Material and methods

3.1 Animal types

The research is addressed to two breeds of goat, namely: Peranakan Etawah goat and Kacang goat. The Kacang goat is a local (indigenous) breed of goat found in Indonesia. The Peranakan Etawah goats descend from crossings between the Kacang goat with the Etawah (Jamnapari) goat.

3.2 Study location

On-farm research commenced in December 1999 and was finished in July 2002, located in the Grobogan and Purworejo region, Central Java, Indonesia. Indonesia consists of over 17,000 islands spread around 5,600 km from east to west and 1,600 km from north to south. The land area covers 1.8 million km². Java island represents only 6-7% of the total land area, however, it is the most densely populated island in terms of both human and animal populations.

3.3 Data collection and procedures

On-farm research conducted under smallholder (private farms) conditions involved approximately 480 does and 2000 kids of Peranakan Etawah and Kacang goats. The study commenced with primary visits to identify herd and individual female goats. The herds were monitored (visited) regularly. Each herd was visited at the commencement of the study and does were identified with a necklace tag. The following data were collected during the initial visit: (1) Herd details including numbers and breeds, type of operation and management practice; (2) individual female goat details including breed, age, number of previous lactations (parity). Herd owners and village staff (or head of co-operation and extension worker) were issued with scales to help record birth and doe weight. Breeding record cards were also prepared to help collect data related to date of mating, kidding date and sex of kids. Some equipment required in this work: livestock record (form), breeding record card, identification (marking) tool, weight scale (balance).

In this research, there were some reproduction and production traits of Kacang and Peranakan Etawah goats to be studied.

Reproduction traits studied: (1) type of birth, (2) litter weight at birth, (3) kidding difficulties, (4) litter weight at weaning, (5) survival rate till weaning, (6) kidding interval, (7) doe reproduction index, and (8) doe productivity index.

Production traits studied: (1) average birth weight, (2) average weaning weight, (3) average growth rate till weaning, (4) condition scoring, and (5) leg conformation.

Some factors affecting reproduction and production traits of Kacang and Peranakan Etawah goats were examined; (a) Reproduction factors: parity,

type of birth, litter weight at birth, and litter weight at weaning, (b)
Production factors: parity, type of birth, sex and birth weight

3.4 Statistical data analysis

Information obtained will be used to examine the reproduction and production traits. Data was analysed using the General Linear Model (GLM). Various models were developed for these variables. Type of birth was assessed by the parity affect. For litter weight at birth, the variables of parity and birth type were evaluated. For kidding difficulties and litter weight at weaning, the variables of parity, birth type, and litter at birth were evaluated. For survival rate until weaning, kidding interval, doe reproduction and production index, the following affects were assessed: parity, birth type and litter at weaning. The following effects: parity, birth type, sex and birth weight are used to assess the production traits (weaning weight, growth rate until weaning, body scoring and leg conformation). For birth weight, the following effects: parity, birth type and sex were evaluated. (See the matrix on Table 1 and 2).

Tab. 1: Matrix of factors affecting reproduction traits under study

Trait under study	Reproduction factor			
	Parity	Type of Birth	Litter weight at birth	Litter weight at weaning
Type of birth	X			
Litter weight at birth	X	X		
Kidding difficulties	X	X	X	
Litter weight at weaning	X	X	X	
Survival rate till weaning	X	X		X
Kidding interval	X	X		X
Doe reproduction index	X	X		X
Doe productivity index	X	X		X

Tab. 2: Matrix of factors affecting productivity traits under study

Trait under study	Production factor			
	Parity	Type of birth	Sex	Birth weight
Birth weight	X	X	X	
Weaning weight	X	X	X	X
Growth rate till weaning	X	X	X	X
Condition scoring	X	X	X	X
Leg conformation	X	X	X	X

Preliminary results and discussion

The reproductive timing (breeding)

Both Kacang and Peranakan Etawah does in Indonesia are capable of breeding all the year round (January till December). There is no breeding season for both Kacang and Peranakan Etawah goats. Lindsay et al. (1982) state that this may be because there is little variation in day length in the tropical region and changes in day length are believed to be the signal which control seasonal rhythms in temperate regions. It may also be because Indonesian breeds are incapable of responding to a change in day length. Restall (1991) reported that goats in the Tropics are aseasonal. Riera (1982) classified goat breeds into continuous and seasonal types. The former include breeds from India, Africa, Malaysia, Indonesia and several countries in South America. Some of these show a seasonal pattern that Riera concludes are determined by rainfall and nutrition.

Age at first breeding in females

Puberty is generally considered to be related more to growth than age in tropical goats (Devendra and Burns, 1983), with first estrous occurring with the attainment of 60-70% of adult live weight. In this research on both Kacang and Peranakan Etawah goats, does show a wide variation in age at first breeding. Age at first mating of female goats ranges between a minimum of 7 months in the Kacang goat to a maximum of 2 years in Peranakan Etawah goats. The survey of village goats (Saithanoo et al., 1991) showed that 60% of does conceived before 7 months, with an average age at first kidding of 12.4 months.

The age at which animals first begin to breed is important for two reasons: Early breeding can improve the rate of turnover of generations of animals and so speed up genetic progress (Lindsay et al., 1982). Lifetime reproductive efficiency is greatly increased by early breeding (Edey, 1983). This is a sound strategy and one that occurs as a natural consequence of a village management system where male goats are continually present and fertility control is not practiced. However, an understanding of the factors affecting development of puberty in tropical goats is lacking, particularly the effect of association with the opposite sex.

Type of birth

Number of kids born per doe indicated multiple births (Amoah, 1990). Litter size was defined as the number of total born kids per kidding per doe (Alexandre et al., 1999). Litter size ranged between 1 and 3 in all herds and breeds. The average litter size at birth of Kacang and Peranakan Etawah were 2.06 and 1.56 kids, respectively. Birth type percentage of Kacang goat showed that the single, double and triplet type were 15.3%,

63.4%, 21.3%, respectively. Birth type percentage of Peranakan Etawah goat showed that the single, double and triplet type were 40.8%, 55.7%, 3.5%, respectively. The average litter size at birth of Kacang goat was higher than litter size at birth of Peranakan Etawah goat. The litter size was related to doe age and parity (Amoah and Gelaye, 1990). Parity, season and year significantly influenced litter size at birth (Awemu et al., 1999).

Kidding difficulties

Mechanical difficulties at parturition sometimes develop from inter-breed crosses (Lindsay et al., 1982). Various *malpresentation* may occur or the foetus may be relatively large compared with the mother (Edey, 1983). Abnormal positions are sometimes seen and occur more frequently with twins (Bearden and Fuquay, 2000). Some typical problems of *presentation* at birth are: one leg back, head only, forelegs only, breech birth - hindlegs and tail, and twin or triplets mixed up (Steele, 1996).

This research did not show any kidding difficulties in all herds and breeds. Lindsay et al. (1982) found in some circumstances breeding of females is deliberately delayed to prevent them being too small at parturition, with the possibility of distocia. Extreme care must be taken, however, when mating small indigenous breeds with imported animals because the larger conceptus may well be too large and lead to distocia.

Survival rate

The survival rates calculated for two different ages such as 1 day (at birth) and 4 months (at weaning) of ages is presented in Table 3.

Tab. 3: Survival rate of Kacang and Peranakan Etawah goats

Survival rate	Kacang kid	Peranakan Etawah kid
At birth (%)	100	100
At weaning (%)	97	92

The successful end of the reproductive process depends on the born animal surviving (Lindsay et al., 1982). There was a significant influence of birth weight on the mortality rate. Mortality generally decreased as the birth weight of kids increased (Awemu et al., 1999). It was evident that survivability of kids increases with the increase of birth weight of kids and milk yield of dams. The higher survival rates were noticed for male kids, this is mainly due to significantly higher birth weight of male kids (Husein et al., 1995). It is common experience that multiple birth in goats are associated with a high mortality rate (Devendra and Burn, 1983). The environmental factors exerted significant influences on preweaning mortality (Awemu et al., 1999).

Main factors closely related to higher kids mortality are birth weights, milk production by dam, predators, diseases and accidents. Among the factor affecting kid survivability during the pre-weaning period, birth weight is mostly consistently identified as a primary contributing factor in early kid mortality (Sing et al., 1990). Mortality rate generally decreased with the increasing parity. This may attribute to physiological maturity of older does and their ability to provide enough milk for the kids (Awemu et al., 1999). Overall survival rates until weaning in this research (97 and 92% for the Kacang and Peranakan Etawah goats, respectively) seemed to be similar than those reported by Anggraeni et al. (1995) and Sodiq (2000, 2001)

Kidding interval

The interval between kiddings is an important predictor of life time productivity (Awemu et al., 1999). There was no significant difference in the post partum anoestrus interval for does giving birth to different numbers of offspring (Greyling, 2000). Amoah et al. (1996) have stated that the gestation period was significantly affected by breed, litter size and parity.

The interval between kiddings ranged from a minimum of 205 days in Kacang goats to a maximum of 450 days in Peranakan Etawah goats. Kidding interval varied among herds and breeds. The average kidding interval of Peranakan Etawah goat (240 days) was longer than that of Kacang goats (320 days). This depends on the service period (which is the period between kidding and conception) and the gestation period. There were limited results for service periods in this study, which is also influenced by fertility of doe and management or breeding policy of the owner. Das (1993) demonstrated that old does (3-4 year) tended to have lower kidding intervals than the younger (1-2 years) and older does (>5 years). This is probably due to the reproductive physiology function being more active in 3-4 years old does compared to lower activity in younger and older does.

Doe reproduction index

The productivity of any breeding females is determined by the number of progeny delivered in a given period of time (Greyling, 2000). The average doe reproduction index of Kacang and Peranakan Etawah goats was 3.07 and 1.65 kids/doe/year. Showing that on a doe reproduction index, crossbred genotype (Peranakan Etawah goat) were inferior to the native does (Kacang goat). These findings are higher than reported by Anggraeni et al. (1995) and Sodiq (2000; 2001) on the doe reproduction index of Peranakan Etawah goat under the Village Breeding Center.

Awemu et al. (1999) demonstrated that the environmental factors exerted a significant influence on reproductive performance. The results call for

management efforts to curb mortality, increase litter size at birth and at weaning, and to reduce intervals between kiddings, in order to improve the productivity of goats. The effect of the type of birth was highly substantial in goats, with multiple births producing more than single births (Awemu et al., 2000). The interval between parturition and the first post partum oestrus is an important trait which contributes to the productive efficiency (Greyling, 1999). The prolonged kiddings' interval was responsible for a decrease in productivity of goats (Awemu et al., 1999).

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