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## **Reproduction Rate of Kacang and Peranakan Etawah Goats under Village Production Systems in Indonesia**

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### **Abstract**

*Small ruminants like sheep and goats are important for a larger part of the Indonesian rural population. The existing goat husbandry is normally the result of hundreds of years of tradition. The major feeding systems in goat production found in Indonesia are the cut and carry and grazing systems. The number of goats raised per farm is relatively small. Goats 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. The evaluation of the reproduction rate of local and adapted breed of goats can provide important information to understand its productive potential using local resources. The major breeds of goats found in Indonesia are the Kacang and the Etawah goats. Indonesia is situated roughly between 6° to 11° north latitudes and 95° and 141° east longitudes. The temperature stays within a constant range, 23-31°C daily in the low plains and 18-27°C in the inferior plateau. Reproduction data of 173 and 189 Peranakan Etawah and Kacang does, respectively, were collected through on-farm research over 20 months in smallholders' agriculture located in Central Java, Indonesia. At every reproductive event, date and number of the animal concerned were recorded. Parity, type of birth and litter weight at weaning were identified on the reproduction rate of Peranakan Etawah and Kacang goats. General linear model was applied in the data analysis. The average reproduction rate of Kacang and Peranakan Etawah does was 2.95 and 1.76 kid/doe/year, respectively. Least squares analysis of variance reveals that doe reproduction rate was significantly affected by parity, type of birth and litter weight at weaning. The reproduction rate of Kacang and Peranakan Etawah does tended to increase with the advance in parity up to the 4th parity and slightly decrease thereafter. The reproduction rate increased progressively with the advance in birth type. Results also demonstrated that at each 1 gram increase in litter weight at weaning there was an increase of 0.17 and 0.08 reproduction rate of Kacang and Peranakan Etawah does, respectively.*

**Keywords:** Goat reproduction, Kacang goat, Peranakan Etawah goat, Indonesia

## **2 Background and Aim of the Study**

In Indonesia, goats are kept as an important component of farming activities, particularly by smallholders. Nearly ninety nine percent of small ruminants such as goat and sheep are found the hand of smallholders. This fact indicates an important role for smallholders. Small ruminants production plays an important role as an income generating activity, particularly for the smallholders, whilst being a source of animal protein to support the national program (Soedjana, 1993). The biological and economic function of goat has 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; Sabrani and Knipscheer, 1992).

The existing husbandry management systems in tropical countries such as Indonesia are normally the result of hundreds of years of tradition (Chaniago, 1993). Goats 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 head (Adjisoedarmo, 1991; Sodiq et al., 2001). The common productive systems for small ruminants in Indonesia are (1) cut and carry, where forage and other feeds are brought to continuously housed animals (Djajanegara and Setiadi, 1991; Sodiq et al., 1998; 2000); and (2) grazing under tree crops, along roadsides, in temporarily idle croplands, etc. (Bradford, 1993).

The majority of goats in Indonesia are concentrated in the Island of Java (DGLS, 1999) the major breeds being the Kacang and Peranakan Etawah goat (Djajanegara and Setiadi, 1991; Edey, 1983). Kacang is a local (indigenous) breed of goat found in Indonesia. The Indonesian breeds of goats are small and relatively slow-growing. Genetic improvement programs may be based on crossbreeding between local breeds or between local and exotic stock (Tawfik, 2001). The introduction of specialized breeds for meat or milk productivity may be a rapid solution for increasing productivity (Edey, 1983).

Reproductive performance is one of the main determinants of productivity of the goat. This applies to the breeding of animal for meat production (O'Shea, 1993). High reproduction rates are essential for profit in meat goat production (Ezekwe and Lovin, 1996) and determined by the number of progeny delivered in a given period of time (Greyling, 2000). The biological productivity of livestock is determined by the fundamental processes of reproduction, growth and development, and death. 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). The most important factor affecting offtake rates is the number of young weaned per female per year (Bradford, 1993). 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.

The objectives of this study are: (1) To find out the reproduction level of Kacang and Peranakan Etawah goats under the Village Production System, and (2) to identify factors affecting the reproduction level of Kacang and Peranakan Etawah goats under the Village Production System. Some factors examined in this study were: parity, type of birth and litter weight at weaning.

### **3 Methodology**

#### **3.1 Location**

The study was conducted from December 1999 till July 2002, located in Grobogan and Purworejo, Central Java, Indonesia. This study was part of a doe productivity evaluation program under the village production system. 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.

### **3.2 Animals**

The research concentrated on two breeds of goat in Indonesia: Peranakan Etawah and Kacang goat. The Kacang goat is a local (indigenous) breed of goat, found in Indonesia. The Peranakan Etawah goat descended originally from crossings between the Kacang goat with Etawah (Jamnapari) goat.

### **3.3 Data collection and analysis**

Reproduction data of 173 and 189 Peranakan Etawah and Kacang does, respectively, were collected through on-farm research over 20 months in smallholders' agriculture located in Grobogan and Purworejo regency, Central Java, Indonesia. 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 neckband tag. Some factors affecting reproduction traits of Kacang and Peranakan Etawah goats were examined: parity, type of birth and litter weight at weaning. Reproduction rate defined the number of kids weaned per doe during a year (kid/doe/year). Birth type consisted of single, twin and triplets. Parity defined was based on the number of times the does had kidded (1, 2, 3, 4, 5 and 6).

All information obtained was used to examine the reproduction traits. The following effects: parity, birth type and litter weight at weaning were used to assess the reproduction traits. The number of animals in a flock converted in Small Ruminant Unit (SRU) were used as a co-variate. The SRU system refers to DGLS (1999). The data were analysed statistically according to the analysis of variance procedure using the General Linear Model (GLM) of Statistical Product and Service Solution software (SPSS Inc., 1999). Duncan's multiple range and Tukey's honestly significant difference test were used to identify significant differences. The linear regression on litter weight at weaning was calculated to access the reproduction rate. SigmaPlot 4.0 for Windows software (SPSS Inc., 1997) was used to produce the exact graphs that represent reproduction traits under certain factors according to the results of statistical analysis.

## **4 Results and discussions**

In a tropical country such as Indonesia, the Kacang and Peranakan Etawah goats are capable of breeding all the year round (January till December). There is no breeding season for Kacang and Peranakan Etawah goats. Restall (1991) reported that goats in the tropics are aseasonal. 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 (Lindsay et al., 1982).

One of the most favorable attributes of goats as meat producing animals is their high rate of reproduction (Wildeus, 1996; Naude and Hofmeyr, 1981) and determined by the number of progeny delivered in a given period of time (Greyling, 2000). The overall mean of reproduction rate of Kacang and Peranakan Etawah does in this study was 2.95 and 1.76 kid/doe/year, respectively. This value is close to those reported by Anggraeni et al. (1995) and Sodiq (2000; 2001) for the Peranakan Etawah goat.

Ingo (1999), Awemu et al. (1999), Bearden and Fuquay (2000) and Das (1993) demonstrated that the environmental factors exerted a significant influence on reproductive performance. The result

show that the reproduction rate of Kacang and Peranakan Etawah does are significantly affected by parity (Figure 1) and litter size (Figure 2). The results also demonstrated that at each 1 gram increase in litter weight at weaning there was an increase of 0.17 and 0.08 reproduction rate of Kacang and Peranakan Etawah does, respectively.

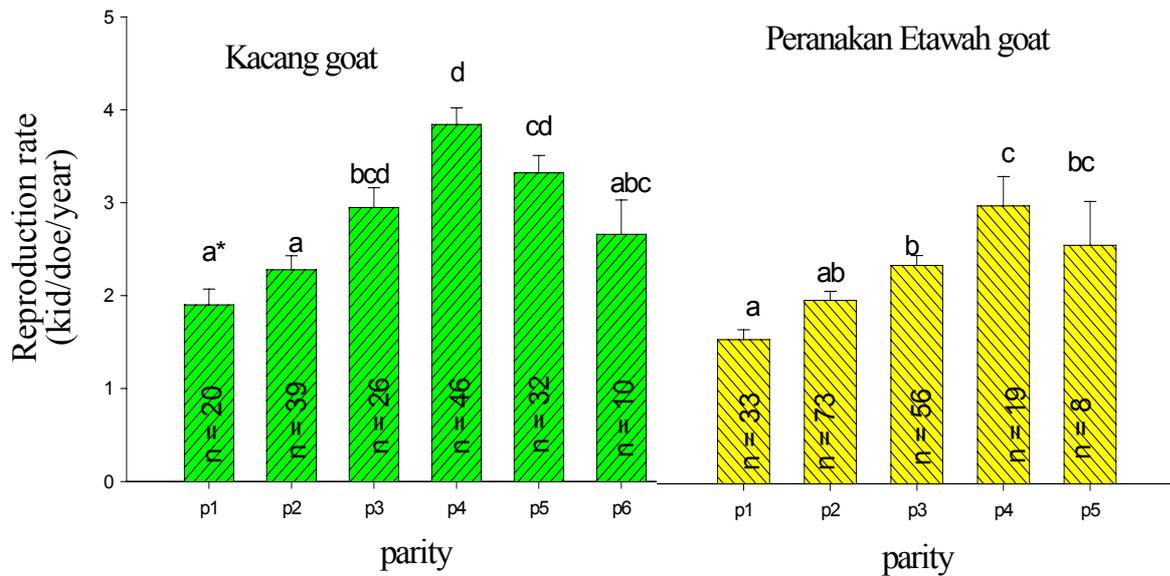


Figure 1. Average reproduction rate of Kacang and Peranakan Etawah goats at different parities. \*Means, within the same classification followed by different letters are significantly different ( $P \leq 0.05$ ), otherwise not. n = number of does.

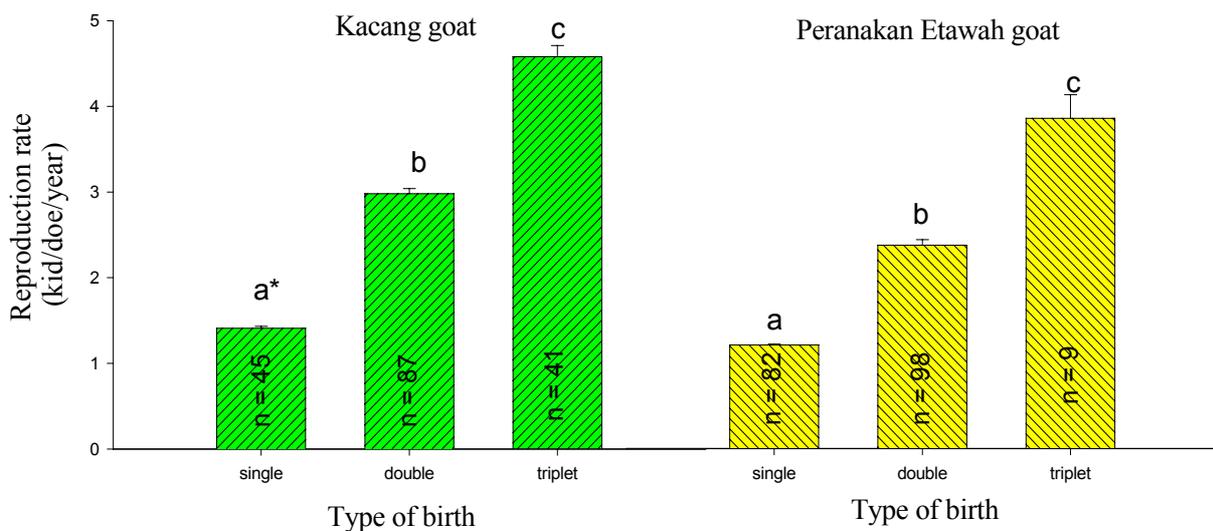


Figure 2. Average reproduction rate of Kacang and Peranakan Etawah goats at different type of birth. \*Means, within the same classification followed by different letters are significantly different ( $P \leq 0.05$ ), otherwise not. n = number of does.

Figures given in Figure 1 show that the reproduction rate of Kacang and Peranakan Etawah does tended to increase with the advance in parity up to the 4<sup>th</sup> parity and slightly decrease thereafter. Figure 2 shows that the reproduction rate of Kacang and Peranakan Etawah does increased progressively with the advance in birth type. The reproduction rate depends on the number of litter at birth, survival rate till weaning and interval between kiddings (Sutama, 1995; Gatenby, 1995). The effect of the type of birth was highly substantial in goats, with multiple births producing more than single births and the prolonged kiddings' interval was responsible for a decrease in reproduction and productivity of goats (Awemu et al., 1999). The interval between parturition and the first post partum oestrus is an important trait which contributes to the productive efficiency (Greyling, 2000).

The effect of parity on the reproduction rate of Kacang and Peranakan Etawah goats was demonstrated in this study. The lower reproduction rate of Kacang and Peranakan Etawah does may be related to the interval between kiddings which is consistent with the report of Awemu et al. (1999), Wilson and Light (1986), Wilson et al. (1985) and Mtenga et al. (1994). This study revealed that parity significantly affected the kidding interval of Kacang and Peranakan Etawah goats which generally decreased with parity till the 4<sup>th</sup> parity. The kidding interval of Kacang goat in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> parities were 271, 262, 243, 217, 223 and 239 days, respectively. The kidding interval of Peranakan Etawah goat in the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> parities were 334, 312, 301, 278 and 291 days, respectively. Wilson and Light (1986) reported that females at early parities take longer than older animals to return to their reproductive status. Wilson et al. (1985) have shown that prolonged kidding intervals were responsible for a decrease in the overall productivity of goats and sheep on a Masai group ranch in South Central Kenya. The kidding interval itself has been reported to be affected by a number of environmental factors including parity (Wilson and Light, 1986; Mtenga et al., 1994).

Parity significantly influenced litter size at birth and pre-weaning mortality of Kacang and Peranakan Etawah goats. These results are consistent with the report of some researchers Amoah and Gelaye (1990), Das (1993), Wilson and Light (1986), Awemu et al. (1994, 1999), Mtenga et al. (1994), Husain et al. (1996). Litter size was related to doe age and parity (Amoah and Gelaye, 1990) on female goats in South Pacific Countries. Das (1993) working on meat goats in Malya, Tanzania reported that prolificacy tends to increase from first parity and decrease in the sixth parity. Litter size increased with parity with the largest litter at the fifth parity on goat and sheep in Central Mali (Wilson and Light, 1986) on Red Sakoto goat in Nigeria (Awemu et al., 1994). Lower prolificacy of primiporous does may be associated with an underdeveloped state of the reproductive features required for successive litter bearing compared with those of multiparous does that have reached physiological maturity. The mortality rate generally decreased with increasing parity (Mtenga et al., 1994). This may be attributed to physiological maturity of older does and their ability to provide enough milk for the kids. However, other workers reported an increase in the mortality rate with parity due to an increased rate of twinning as parity increased (Awemu et al., 1994). Results of Husain et al. (1996) concluded that the effect of parity was significant but survivability increased gradually with the increase in parity number having the highest survival rate in the 5<sup>th</sup> parity.

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