Litter Size and Lamb Survivability of Batur Sheep in Upland Areas of Banjarnegara Regency, Indonesia

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Abstract. The objective of the current study was to find out the litter size and lamb survivability of Batur sheep, and also to identify the effects of ewe parities on litter size and lamb survivability; and the effects of birth type on lamb survivability of Batur sheep. The study was conducted at the Batur sheep Farming Group in the upland areas of Banjarnegara regency, Central Java province of Indonesia. Data from 311 records of lambing of Batur sheep at the village breeding centre for Batur sheep were analyzed. Least squares procedure by the General Linear Model was used to identify the effect of parity on litter size at birth and at weaning. Preweaning survivability was analyzed using the Chi-squares. Results showed that average litter size at birth and at weaning, and lambs survivability till weaning were 1.55±0.03 and 1.36±0.03 lambs; and 88.42%, respectively. Litter size at weaning and lambs survivability was significantly different among ewe parities, and increased by advancing ewes parities. Its indicating that age of ewe was important factor for the success in early stage for producing lamb. Survivability of single lamb (93.62%) was significantly higher that twins (84.11%). Increased care for twins by providing proper management might lead to a recognizable increase in lamb survival and flock productivity of Batur sheep.

Key words: Batur sheep, litter size, lamb survivability, parity, preweaning

Introduction

Small ruminants such as sheep and goats help to provide extra income and support survival for many farmers in the tropics and sub-tropics (Mukasa-Mugerwa et al., 2000; Sodiq and Tawfik, 2004). An important attribute of the sheep is that it can live and produce on land unfavorable for other forms of agriculture (Morris, 2009) and also have the ability to forage and survive in areas, where cattle would perform poorly. Indigenous and local sheep are important for subsistence and socio-economic livelihoods of rural communities (Kunenea et al., 2009). In Banjarnegara regency, Batur sheep has been taking place on upland areas and has made a major contribution to environmental and social development in those areas. They are reared as a vital component of integrated farming activities, especially by small holders of horticulture farming. Commonly, raising sheep for producing meat and lamb, and also producing dung for providing compost.

Batur sheep are the predominant breed in the upland areas of Banjarnegara where they are well adapted to the local cold humid environment. Those breed are developed by crossing between local breeds (Fat and Thin Tailed Sheep, Garut sheep) and imported breed (Merino) (Prayitno, 2010). Population of Batur sheep has increased by nine percent over the pas one year (Dinas Pertanian, Perikanan dan Peternakan Kab. Banjarnegara, 2010) with the population dynamic in terms of net rate of numerical growth ranged from -75 up to 400% (Sodiq, 2011). Those figure indicating the vital roles of Batur sheep to the livelihood of rural communities particularly in Batur and Pejawaran subdistrics.

The greatest part of the income in sheep production system is supplied through lamb production (Mokhtari, 2010; Ekiz et al., 2005). Efficiency of lamb production is controlled by reproduction, mothering ability and milk production of the ewe, as well as growth rate and survival of the lamb (Bromley et al., 2001; Rao and Notter, 2000). Important component in term of economic trait of sheep production are litter size (Casellas et al., 2007), lamb survival (Conington et al., 2004; Southey, 2003; Southey et al., 2001; Lopez-Villalobos and Garrick, 1999; Amer et al., 999), and seasonal nature of ewe fertility (Casas et al., 2005; Notter, 2002). For this reason, litter size and lamb survival has been the objective of many studies (Baneh et al., 2009; Riggio et al., 2008; Duguma et al., 2002), especially in countries where traditional husbandry systems predominate. Therefore, the objective of the current study was to find out the litter size and pre-weaning lamb survivability of Batur sheep, and also to identify the effects of ewe parities on litter size and lamb survivability, and the effects of birth type on lamb survivability of Batur sheep

Materials and Methods

The study was conducted at the Batur sheep Farming Group in the upland areas of Banjarnegara regency, Central Java province of Indonesia. The altitude of regions around 800-1200 m above sea level with the annual rainfall average 2867 mm. Batur sheep are housed at night in elevated pens with slatted floors, and are provided with feed cut and carried from roadsides, fallow land, and also from special land for growing forages. Some family flocks are permanently housed, while in others they graze under supervision and tethering during part of the day. They are maintained in family flocks of ranged from 2 to 70 head and average 9 head (Sodiq, 2011).

Litter size at birth and at weaning, and pre-weaning lamb survivability were recorded from 311 lambing at the village breeding centre for Batur sheep. Least squares procedure by the General Linear Model (GLM) was used to identify the effect of parity on litter size at birth and at weaning. Preweaning survivability was analyzed using the Chi-squares.

Results and Discussion

Litter sizes at birth and at weaning

The overall letter size at birth and at weaning of Batur sheep were presented in Table 1. Average litter sizes at birth was 1.55±0.03 lambs and litter size at weaning was 1.36±0.03 lambs. This finding are close to those obtained by Sutama (1991), which litter size at birth of Indonesian Fat Tailed Sheep was 1.57. Litter size at birth on Local sheep was 1.61±0.14 lambs (Astuti et al. 1984). Litter size of Sumatra Thin Tailed sheep averaged 1.52±0.04 lambs at birth and 1.23±0.04 lambs at weaning (Doloksaribu et al., 2000) which have a relatively low frequency of the prolificacy gene (Roberts, 2000). Subandriyo et al. (1996) and Gatenby et al. (1997) reported the litter size of Sumatra sheep and crosses with imported breeds St.Croix, Barbados Blackbelly were 1.5, 1.49, and 1.46 lambs, respectively.

Prayitno (2010) reported that Batur sheep resulted from crossing between local breeds (Fat Tailed Sheep, Thin Tailed Sheep, Garut Sheep) and imported breed (Merino). Molecular analysis reveled that Batur sheep were close to Merino breed in term of very close in genetic distance. Ekiz et al., 2005 reported litter size at birth and at weaning of Turkish Merino were 1.42 and 1.36 lambs, respectively. Other researchers report the litter size at born was 1.36-1.62 for Karacabey Merino ewes (.zcan et al., 2002; Yõlmaz et al., 2003; Altõnel et al., 2000). The litter size at weaning for Konya Merino ewes ranged from 1.10 to 1.39 (Thieme et al., 1999). The litter size at birth and at weaning obtained in the current study of Batur ewes were higher than the reports summarized above for Turkish Merino ewes.

Litter size of Batur ewes was affected by ewes age (parity) and litter size at weaning increase with increasing parity (Tabel 1). This analysis revealed that litter size at weaning differed (P<0.001) among ewes parities. These results agree with those obtained by Afolayan et al. (2008), Ekiz et al. (2005), and Maria and Ascaso (1999). It is well documented that litter size improves with advance in age through increased ovulation rate, uterine capacity and other maternal traits affecting the reproductive efficiency of the ewe (Fahmy, 1990). Lower prolificacy of primiparous ewes 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.

In this current study, the lowest litter found in the first parity and the largest litters were observed in ewes in their third and fourth parities (Table 1). There was a tendency for the productivity of ewes to improve with age (Ekiz et al., 2005) generally reaching a maximum between four and seven years of age for ewes. Litter size of Turkish Merino at 2, 3, 4, 5, 6, and 7 years old of age were 1.18, 1.38, 1.49, 1.51, 1,49 and 1.48 lambs (litter size at birth); and 1.01, 1.33, 1.42,1.43, 1.47 and 1.43 (litter size at weaning), respectively. In other breeds, prolificacy was affected by age of the ewe and was highest for ewes lambing between 4 and either 7 (Polypay) or 8 (Targhee and Suffolk) years of age. Peak prolificacy was generally achieved between 4 and 8 years of age. Ewes that were more than 8-year-old at lambing had 0.17±0.20 fewer lambs per ewe lambing than the 3- to 6-year-old ewes (Notter, 2000).

Preweaning lamb survivability

Overall preweaning survivability of Batur lambs was 88 percent (Table 2). Survival rates observed for Batur lambs were better than those observed by other researchers for various Indonesian breeds (Sodiq, 2000; Sodiq and Tawfik, 2004; Anggraeni et al., 1995). The average lamb survivability of local sheep under traditional and improved management were 64 and 91 percent (Sodiq, 2000), 80 and 97 percent (Anggareni et al., 1995), respectively. Inounu et al. (1993) observed of Javanese ewe found that stillbirths constituted 52% of mortality to weaning.

The result of the Chi-square test on preweaning survivability rate is presented in Table 2. Single Batur lamb survivability (94%) was significantly higher ($P<0.05$) than in twins (84%). In general, this finding agrees with results other researchers that lambs in larger litters have lower survival rates (Southey, 2003; Southey et al., 2001; Maria and Ascaso,1999). Single and twin lambs had 70 and 53% lower hazard of mortality than multiple-born lambs, respectively (Southey, 2003). On the other hand, single and twin lambs had 29 to 43% and 47 to 55%, respectively, of the hazard of multiple lambs (Southey et al., 2001) and higher litter sizes have reduced birth weight and hence the survival of lambs (Turkson and Sualisu, 2005; Sušić et al., 2005). The causes of lamb mortality were largely linked to management since they mainly related to low birth weights (Mukasa-Mugerwa et al., 2000). Survival from birth to weaning is directly related to the weights of individual lambs at birth, and there is a strong inverse relationship between survival to weaning, and litter size.

Doloksaribu et al. (2000) working on Indonesian Thin Tailed ewes in Sumatra found that mortality increased substantially with litter size; it was 3.1% for single lambs, 19.6% for twins and 54.7% for triplets and quadruplets. Mortality in the first and second litters was 12.4 and 26.1%, respectively. Larger litters comprise a larger proportion of ewe weight gain during gestation than do singles (Inounu et al., 1993), so after parturition ewes with larger litters have lower body reserves and are less able to provide colostrum and milk for the small lambs in those litters. This leads to lower survival rates of lambs to weaning (Roberts, 2000). Moreover, the low survival rates in larger litters are exacerbated when the level of nutrition is low. Survival of lambs, particularly those in larger litters, is dependent on the levels of nutrition and management in a flock. The survival rates of lambs in larger litters, would increase from the commencement of better husbandry in a flock, and continue to improve over a full reproductive cycle. Survival of lambs is inversely related to litter size regardless of the level of husbandry.

The result of the Chi-square (Table 2) revealed that Batur lambs survivability was significantly different (P<0.001) among parities. Batur lambs survivability increased by advancing parities and indicating that age of ewe was important. These results agree with finding of Roberts (2000), Doloksaribu et al (2000), and Gatenby et al. (1997). Maria and Ascaso. (1999) revealed that lamb mortality in ewes in first parity ewes was higher than that observed in adult ewes. Sierra (1990) working with cross-bred RA and RO ewes found an increasing lamb mortality across parities. Litter size increased progressively with advance in parity (Maria and Ascaso. 1999). It is well documented that litter size improves with advance in age through increased ovulation rate, uterine capacity and other maternal traits affecting the reproductive efficiency of the ewe (Fahmy, 1990). The largest litters were observed in ewes in their fourth parity). This may be attributed to the physiological maturity of older Batur ewe and their ability to provide enough milk for producing high weight lambs. Birth weight is a risk factor for lamb survival (Mukasa-Mugerwa et al., 1994) and influenced by ewe prenatal nutrition, litter size, placental size and foetal genotype (Haughey, 1991).

Factors which contribute to low birth

Table 1. Least squares means (LSM) and standard error (SE) for litter size at birth and weaning by parity of Batur ewes

Variable	Litter size at bith (head)			Litter size at weaning (head)		
	n	LSM	SE	n	LSM	SE
Overall	311	1.55	0.03	275	1.36	0.03
Parity		ns			**	
Parity 1	156	1.53	0.04	136	1.24[a]	0.05
Parity 2	92	1.56	0.05	80	1.45[b]	0.05
Parity 3	47	1.57	0.07	44	1.51[b]	0.07
Parity 4	16	1.56	0.12	15	1.50[b]	0.13

Values bearing different superscript at the same column differ significantly (P<0.05); ns P> 0.05, * P<0.05, ** P<0.01

Table 2. Preweaning lamb survivability by type of birth and parity of Batur ewes

Sources	Number of born (n, %)	Preweaning lamb survivability (n, %)
Overall	311 (100)	275 (88.42)
Type of birth		
Single	141 (45.3)	132 (93.62)
Double	170 (54.7)	143 (84.11)
$\chi^2 = 3.93$, $P < 0.05$		
Parity		
Parity 1	156 (50)	136 (87.18)
Parity 2	92 (30)	81 (88.02)
Parity 3	47 (15)	43 (91.49)
Parity 4	16 (5)	15 (93.75)
$\chi^2 = 306.72$, $P < 0.001$		

weight also tend to reduce foetal lipid reserves, limit neonatal vigour, impair colostrum production and restrict ewe milk production (Mellor and Murray, 1985). As a consequence, lambs born light are also more susceptible to the SME syndrome (Davis et al., 1981).

Roberts (2000) reviewed on Indonesian sheep found that about 40% of the total deaths were attributed to lambs being small, weak or immature, and 11% to mis-mothering. For increasing lamb survivability, Mukasa-Mugerwa et al. (2000) has recommend regarding farm management practices of tropical sheep production. In particular, since the relationship between birth weight and survival is causative, it would be advisable to introduce farm (animal) management routines which can help to increase birth weight. One option is to supplement ewes in the last trimester (Mukasa-Mugerwa et al., 1994), especially animals in poor body condition carrying twins since both the foetus and udder undergo rapid development during this period. After birth, steps need to be taken to reduce losses in low weight lambs. One option is to cross-foster or graft light, weak, orphan or abandoned lambs shortly after parturition. The rotation of twins during nursing can also help to ensure that each gets enough milk. Increased care for twins, which are more likely to suffer from the SME syndrome, might lead to a recognisable increase in lamb survival and flock productivity. Ensuring strong ewe-lamb bonding within 12-24 h of delivery also enhances colostrum production by dams and increased intake by lambs.

Conclusions

Average litter size at birth and at weaning, and lambs survivability till weaning of Batur ewe were 1.55±0.03 and 1.36±0.03 lambs; and 88.42 percent, respectively. Litter size at weaning and lambs survivability were significantly different among parities and increased by advancing parities. Its indicating that age of ewe was important factor in early period for the successful program for producing lambs. Survivability of single lamb (93.62%) was significantly higher that twins (84.11%). Increased care for twins by providing proper management might lead to a recognizable increase in lamb survival and flock productivity of Batur sheep.

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