



Factors affecting survival of range sheep in the U.S. and characterization of sheep in Indonesia
by Subandriyo

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in
Animal Science

Montana State University

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Abstract:

Survivability and birth weight of range sheep were studied using lamb records of purebred Rambouillet, Targhee and Columbia sheep born from 1960 to 1982 at the Red Bluff Research Ranch near Norris, Montana. Least squares method for unequal subclass numbers was used to analyze survivabilities and birth weight. Heritability of survivabilities and birth weight were estimated based on paternal half-sib correlation. Year, type of birth, and birth weight generally were the important sources of variation for survivability. Birth weight was an important source of variation and had a curvilinear relationship with survivability. Year, type of birth, sex, age of dam and birth date were the important sources of variation for birth weight. Heritability was low for survivability and moderate for birth weight. Pooled heritability estimates for survivability at 60 d, 120 d and from 60 d to 120 d were .14, .12 and .06, respectively. The pooled heritability estimate for birth weight was .29. Moderate positive genetic correlations were found between birth weight and survivability at 60 d and 120 d, and low genetic correlation was found between birth weight and survivability from 60 d to 120 d.

Growth characteristics and ewe performance traits of Indonesian sheep were studied using data from two sources: the Research Institute for Animal Production station and from the villages, all located in West Java province. Village data were from Javanese thin-tailed sheep (JTT) obtained from Garut (GAR), Ciburuy (CIB) and Cirebon (CIR), representing high, medium and low elevation areas. Data from the station represented JTT and fat-tailed (FT). Least squares method for unequal subclass number was used to analyze those data. Repeatability for ewe performance traits were estimated using intraclass correlation and heritability of postnatal weights and growth were estimated using paternal half-sib correlation. Among the three locations GAR had the heaviest sheep, followed by CIB and CIR. Under experiment station conditions JTT were heavier than FT. Type of birth was the most important source of variation for growth characters. Growth curves indicated that under experiment station conditions sheep grew faster than under village conditions. JTT and FT are relatively prolific sheep. At the villages, GAR had the highest average litter size (1.67) followed by CIB (1.52) and CIR (1.15). At the experiment station JTT and FT had similar size litters (2.00 and 1.95). However, mortality was quite high, and high mortality was associated with multiple-born lambs. Lambing intervals both at the experiment station and villages were similar (259.3d and 252.4d). Repeatability study indicated that ewe weights were highly repeatable, but livabilities, litter weights, and lambing interval were lowly repeatable. Heritability of postnatal growth indicated that subsequent weights after birth and preweaning average daily gain were more highly heritable than birth weight.

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

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ABSTRACT

Survivability and birth weight of range sheep were studied using lamb records of purebred Rambouillet, Targhee and Columbia sheep born from 1960 to 1982 at the Red Bluff Research Ranch near Norris, Montana. Least squares method for unequal subclass numbers was used to analyze survivabilities and birth weight. Heritability of survivabilities and birth weight were estimated based on paternal half-sib correlation. Year, type of birth, and birth weight generally were the important sources of variation for survivability. Birth weight was an important source of variation and had a curvilinear relationship with survivability. Year, type of birth, sex, age of dam and birth date were the important sources of variation for birth weight. Heritability was low for survivability and moderate for birth weight. Pooled heritability estimates for survivability at 60 d, 120 d and from 60 d to 120 d were .14, .12 and .06, respectively. The pooled heritability estimate for birth weight was .29. Moderate positive genetic correlations were found between birth weight and survivability at 60 d and 120 d, and low genetic correlation was found between birth weight and survivability from 60 d to 120 d.

Growth characteristics and ewe performance traits of Indonesian sheep were studied using data from two sources: the Research Institute for Animal Production station and from the villages, all located in West Java province. Village data were from Javanese thin-tailed sheep (JTT) obtained from Garut (GAR), Ciburuy (CIB) and Cirebon (CIR), representing high, medium and low elevation areas. Data from the station represented JTT and fat-tailed (FT). Least squares method for unequal subclass number was used to analyze those data. Repeatability for ewe performance traits were estimated using intraclass correlation and heritability of postnatal weights and growth were estimated using paternal half-sib correlation. Among the three locations GAR had the heaviest sheep, followed by CIB and CIR. Under experiment station conditions JTT were heavier than FT. Type of birth was the most important source of variation for growth characters. Growth curves indicated that under experiment station conditions sheep grew faster than under village conditions. JTT and FT are relatively prolific sheep. At the villages, GAR had the highest average litter size (1.67) followed by CIB (1.52) and CIR (1.15). At the experiment station JTT and FT had similar size litters (2.00 and 1.95). However, mortality was quite high, and high mortality was associated with multiple-born lambs. Lambing intervals both at the experiment station and villages were similar (259.3 d and 252.4 d). Repeatability study indicated that ewe weights were highly repeatable, but livabilities, litter weights, and lambing interval were lowly repeatable. Heritability of postnatal growth indicated that subsequent weights after birth and preweaning average daily gain were more highly heritable than birth weight.

INTRODUCTION

Total lamb production by a flock of sheep at weaning depends on the individual performance of each lamb and the number of lambs reaching weaning age. The latter depends on preweaning lamb survivability, conception rate and lambing rate. Lamb survivability is particularly important when lambs are raised under range conditions where high mortality has been observed. High preweaning lamb mortality not only reduces the total weight of lamb meat and wool produced, but also reduces potential genetic gain by limiting selection in breeding flocks, since fewer replacement animals are available. In addition, ram and management costs per unit of lamb produced are increased.

Several non-genetic factors have been associated with lamb mortality. One important factor is the effect of ewe age. The ewe age effect appears to be mediated through the effect on lamb birth weight as well as more highly developed mothering instincts in older ewes. Type of birth and sex of lambs are other important factors associated with lamb survivability. Lambs born in large litters usually have relatively low survivability. Higher mortality in multiple-born lambs also appears to be associated with light birth weights. Females tend to have higher survival rates than males.

The possibility of improving lamb survivability by genetic means is apparent since breed differences in lamb survival exist, and outbred lambs are generally more viable than inbred lambs. However, evidence for the existence of useful genetic variance affecting lamb survival rates within breeds is limited. Present evidence suggests

that heritability of survivability is low.

A better understanding of the genetic and non-genetic factors associated with lamb survivability is needed. Quantitative information regarding these factors is essential to the development of improved sheep management procedures for survival rates. Successful management procedures to improve survival will enhance production levels and economic returns from sheep production enterprises. Quantitative estimates of the factors affecting lamb survival under range conditions is an objective of this study.

Sheep in Indonesia are an important source of meat production, second only to chickens. They are particularly important in the villages. The total number of sheep in the country at present is about 4.2 million. In 1969-71 the number was 3.2 million (F.A.O., 1982). Thus the sheep population has increased substantially in recent years. Sheep are mostly concentrated in Java. Sheep numbers there represent approximately 80% of the total population, and of those almost 50% are concentrated in West Java (Sabrani et al., 1982).

The most prevalent types of sheep are Javanese thin-tailed (JTT) and fat-tailed (FT). The JTT are mostly found in the humid areas of West and Central Java, while FT are raised mostly in drier areas, for example in East Java and Madura. Sheep of both breeds carry some wool, but the small amount of wool on many animals, presence of some nearly woolless animals, and the very high incidence of kemp fibers in most fleeces suggests mixed wool and hair sheep ancestry. The wool is usually cut off and thrown away. These sheep under village conditions are usually kept in small herds by small holder farmers. A typical

