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Growth pattern and productivity of female Wonosobo sheep in Wonosobo District, Central Java Province, Indonesia

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Abstract. A study was carried out to investigate growth pattern and productivity of female Wonosobo sheep. This study involved 151 female Wonosobo sheep aged from 0-7 days to 48 months. Data collected were including the growth pattern of body weight and body measurements (heart girth, body length, chest depth, chest width, shoulder height, hip height), and ewes productivity (birth weight, weaning weight, litter size, lambing interval, age of first mating and age of first lambing). The data obtained were analyzed statistically and descriptively. The results showed that body weight and body measurements of female Wonosobo sheep increased with age until 36 months of age. Their body measurements and weight were higher than those of local breeds in Indonesia. The average values of Wonosobo ewes productivity were: litter size was 1.45 heads, lambing interval was 9.48 months, age of the first mating was 9.82 months, age of first lambing was 15.86 months, lambs' birth weight was 2.81 kg and lambs' weaning weight was 31.20 kg. It was concluded that female Wonosobo sheep had a medium body size and good productivity.

1. Introduction

Sheep have very promising potential in meat production. The potential of sheep lies in the speed of offspring production; the average of lambing interval is 7.54 months [1] compared to the calving interval of cattle being 12.66 months [2]. In addition, sheep can be expected to produce two lambs or more in a birth [3]. The protein content of lamb meat is 21.9 g/100g, which is not much different from beef meat, being 23.3 g/100 g [4]. Based on these advantages, sheep have great potential to be developed as national meat producers.

Wonosobo sheep is a new breed developed in Wonosobo District, Central Java Province, Indonesia. This breed is developed from the crossing of local breed and Texel. Pratama et al. [5] reported that Wonosobo sheep reached 68.85 kg body weight, which was greater than the fat-tailed sheep that weighed 34.76 kg [6]. The weight of sheep bodies can reflect the weight of the carcass produced [7], so that Wonosobo sheep can be used as a good meat producer.

However, the productivity of Wonosobo sheep, especially the female, has not been explored. There is not enough information of physical traits and productivity of the ewes. Therefore, mapping of physical characteristics is needed in supporting selection efforts to obtain superior livestock. Physical characteristics in the form of body size and performance of parent production can be used as a basis for selection to obtain superior livestock [8]. The selection is the initial stage to serve as a reference in the breeding system to produce offspring of good quality from their parents. The physical



characteristics of livestock can be determined by measuring the body of the livestock and by calculating the performance of the parent production.

The purpose of this study was to examine the physical characteristics and reproduction performance of female Wonosobo sheep as a basic reference in the effort to develop Wonosobo sheep. The benefits of information on the characteristics of the female Wonosobo sheep obtained through this study can be used as a basic reference in determining superior prospective females for the development of Wonosobo sheep.

2. Materials and methods

Research on body size and productivity of female Wonosobo sheep was carried out from May to July 2017 in in Kejajar Subdistric, Wonosobo District, where the population of Wonosobo sheep was concentrated.

2.1. Materials

This research involved 151 female Wonosobo sheep with various ages raised by the farmers. The sheep were divided into 8 groups of age, i.e. 3 lambs aged 0-7 days, 23 lambs aged 1-2 months, 33 lambs aged 2-3 months, 10 lambs aged 4-7 months, 17 young ewes aged 7 -12 months (one pair permanent incisors), 21 ewes aged 12-24 months (2 pairs permanent incisors), 27 ewes aged 24-36 months (3 pairs permanent incisors), and 17 ewes aged 36-48 months (4 pairs permanent incisors). There were also 21 farmers chosen as respondents.

The equipments used were digital animal scale of 150 kg capacity and 0.05 kg accuracy, a measuring stick of 110 cm long and 1 cm accuracy (to measure body length, shoulder height, hip height, hip width, chest and chest width) and measuring tape of 150 cm length and 0.1 mm accuracy. Interview with the farmers was carried with a list of questions guide.

Some text.

2.2. Methods

The research method used in this research is survey method. Determination of the location and sample of the research was carried out by purposive sampling method, meaning that the location selection was based on the largest population and the sample selection based on the criteria: similarity of the breed (Wonosobo sheep), age (0-4 years based on dental configuration) and sex (female). The research location was Kejajar Subdistrict in Wonosobo District, which was the most populated area of Wonosobo sheep.

The data collected were body measurements (heart girth, chest width, chest, body length, shoulder height, hip width), body weight, age of the ewe when mated for the first time, age of the ewe when giving birth for first time, lamb's birth weight, lamb's weaning weight, litter size and lambing interval. Data collection was conducted by measuring body parts and interviews with farmers regarding the profile of farmers and rearing management. Body measurements were taken 3 times to avoid observation errors.

3. Results and discussion

3.1. Rearing management

The results showed that the farmers of Wonosobo sheep did not consider the amount and quality of feed given to the sheep. They did not take into account the physiological status and body weight of the sheep in feeding. They did not differentiate the nutrient requirement of sheep before mating, pregnant and lactating ewes. The feed provided was grass and agricultural waste, without any supplementation. Wardhani [9] and Scaramuzzi [10] state that supplementary feeding at the time of ewes before mating, pregnant and after lambing improve the success of mating of ewes, reduce pre-weaning lamb mortality and increase the likelihood of giving birth with twin lambs.

Farmers did not pay attention to the symptoms of oestrus of their ewes. However, since the rams and ewes were kept together in a colony pen, the oestrous ewes were mated by rams in the right time. This is parallel with the statement of Dobson et al. [11] that one of factors influencing the reproductive efficiency of ewes was time of mating during oestrus. Hastono [12] states that farmers must understand the signs and cycle of oestrus, so that they can find out whether the ewes they raise are pregnant or not. According to Prabowo [13] the symptoms of oestrus in sheep are changes in behaviour, the vulva swells, is red and wet and often wags its tail,

According to Inounu and Soedjana [14] improvement of rearing management can increase the ewes' production including birth weight and weaning weight. Hastono and Masbulan [1] stated that one of the efforts to increase livestock productivity is by increasing the reproductive efficiency of the ewes which can be assessed from the form of reproductive performance of the ewes such as lambing interval.

3.2. *Growth pattern*

Body weight and body measurements of female Wonosobo sheep increased rapidly from the birth to 7 months of age, but the increment started to slow down after the sheep reached 12 months of age (Illustration 1-4). This finding is in agreement with [15] that sheep have high growth rate from birth to puberty, the growth rate then reduces after puberty and stops after the sheep reaches maturity. Based on the data obtained, it can be concluded that the female Wonosobo sheep reached maturity after 12 months old. The age attainment of the body of Wonosobo sheep is in accordance with the quality standards of local sheep seedlings which are used as a basic reference in the selection of superior breeding stock, adult body is achieved at the age of 12-15 months [16]. The results of this study was in line with the finding of Malewa [17] that local sheep in Central Sulawesi achieved adult size in 12 months of age.

Based on the results of the study, the average body weight of Wonosobo sheep in the 12-24 month age group was 38.36 kg. This data show that the body weight of Wonosobo sheep greater than that of the fat tailed sheep and thin tailed sheep. Ashari et al. [6] reported that body weight of fat tailed sheep at 12-24 months ranged between 22.79 and 32.90 kg, while Utami [18] reported that body weight of thin tailed sheep at the age of 12-24 months was 23.00 kg. However, the body weight gain of Wonosobo sheep was smaller compared to that of Texel lamb at the age of 18 months being 56.00 kg, as reported by Janssens and Vansepitte [19].

The average heart girth of female Wonosobo sheep in 12-24 month age group was 79.61 cm. This was larger than that of the fat tailed sheep and thin tailed sheep. Malewa [17] reported that a fat tailed sheep aged 18 months had 73.33 cm heart girth, while [20] reported that heart girth thin tailed sheep of 18 months of age was 70.23 cm. However, the heart girth of female Wonosobo sheep was smaller than that of Texel Lamb at the age of 12-24 months. Janssens and Vansepitte [19] reported that the heart girth of female Texel at 18 months was 93.50 cm.

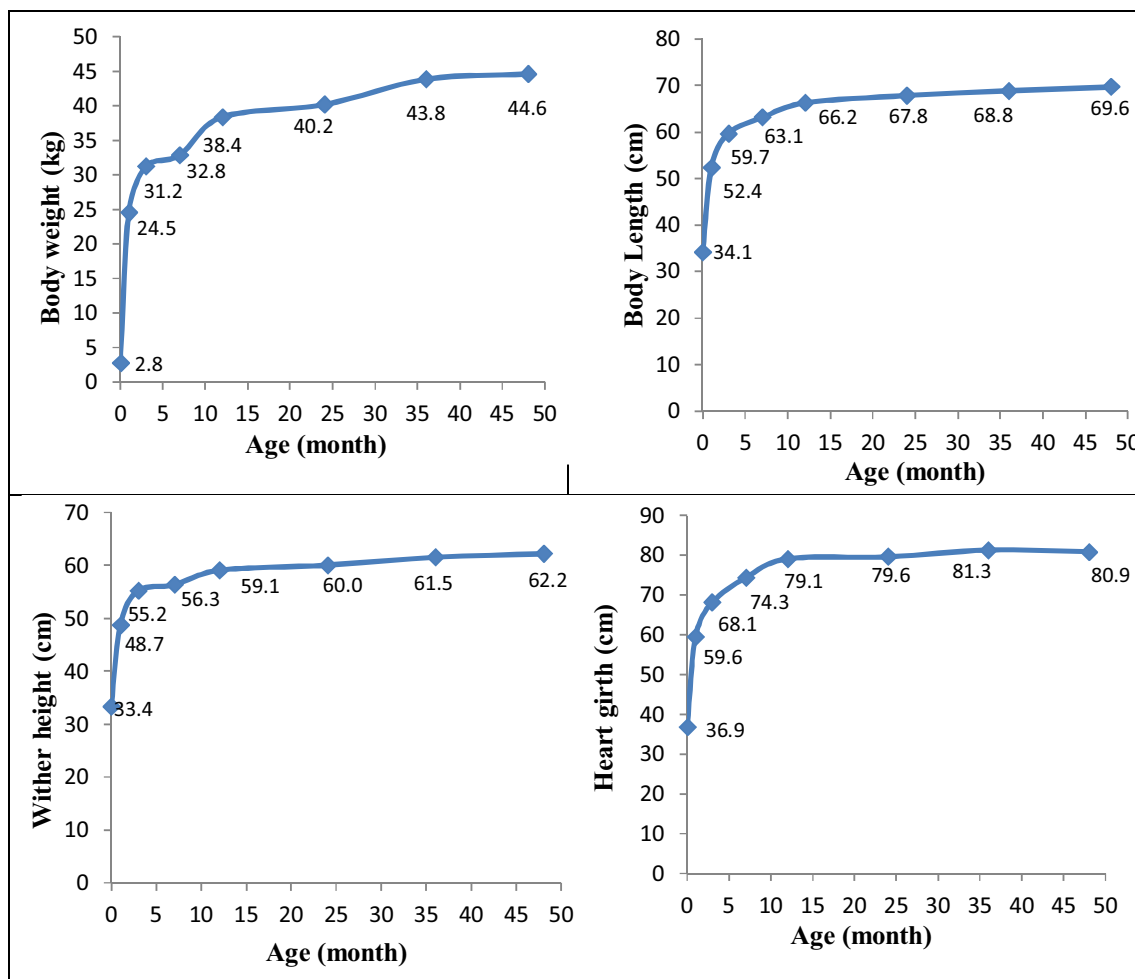


Figure 1. The Development of body weight, body length, wither height and heart girth of female Wonosobo Sheep

The chest depth of average size of female Wonosobo Sheep in the 12-24 month age group was 29.21 cm, larger than that of the fat tailed sheep and thin tailed sheep. Malewa [17] reported that a fat tailed lamb with an age of 18 months had a chest size of 26.17 cm, whereas in the thin tailed Sheep at the age of 18 months had a size in the chest of 25.22 cm [20]. But the size in the female Wonosobo Sheep is smaller when compared to Lamb Texel. Janssens and Vansepitte [19] reported that the chest depth of a female Texel sheep in 18 months was 31.70 cm.

The average body length of Wonosobo ewes in the 12-24 month of age was 67.83 cm. This figure is larger than that of the fat tailed sheep and thin tailed sheep. Malewa [17] reported that local sheep with an age of 18 months had a body length of 55.00 cm, while Tirtosiwi [20] reported that thin tailed sheep of 18 months old had 60.42 cm body length. However, the body length of Wonosobo ewes is lower than that of Texel ewes; Schillewaert [21] reported that the body length of 18 months old Texel ewes was 80 cm.

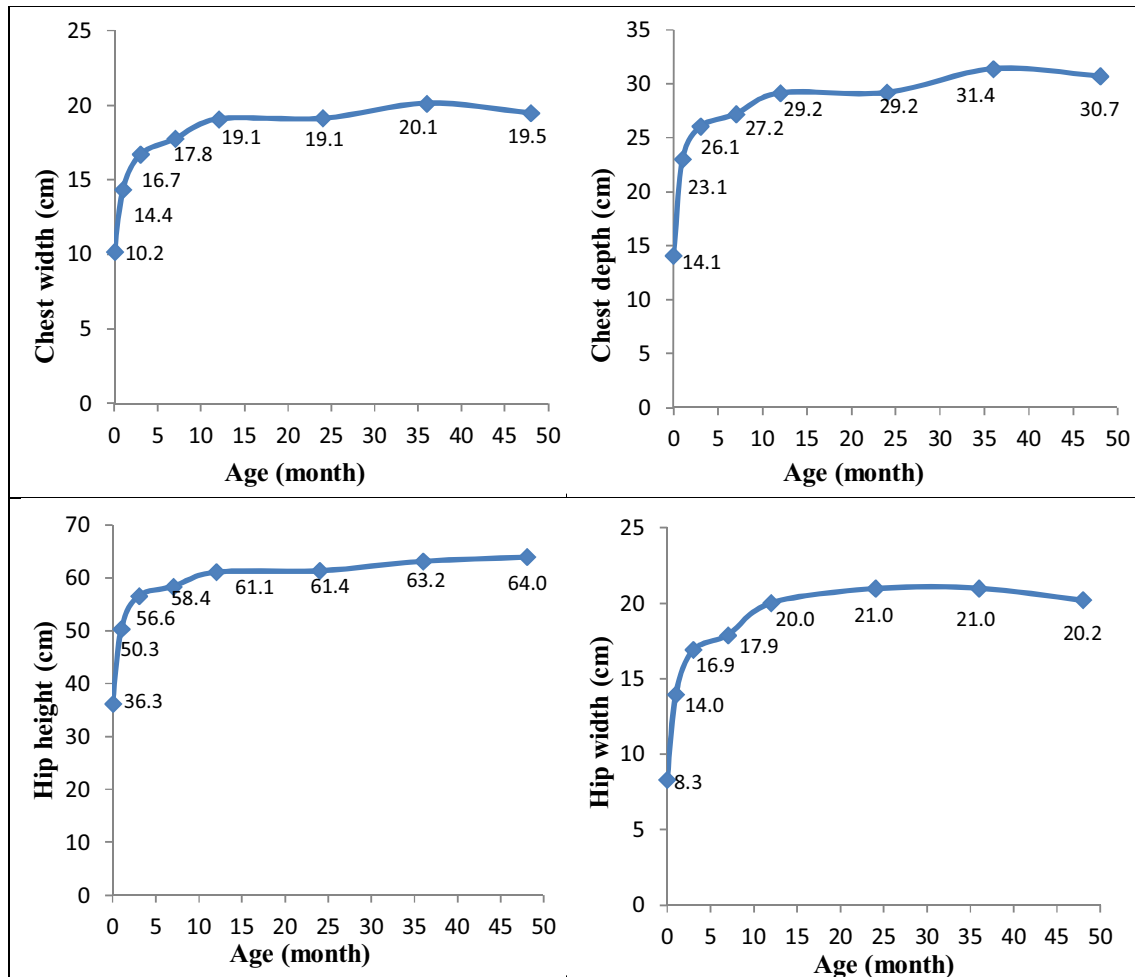


Figure 2. The development of body chest width, chest depth, hip height and hip width of female Wonosobo Sheep

The average size of the female Wonosobo Sheep hip width in the 4-7 month age group is 17.90 cm, larger than the fat tailed Lamb. Munier [22] reported that female Palu sheep with ± 6 months of age had a hip width of 9.10 cm. But the size of the female Wonosobo Sheep hip width is smaller when compared to Texel lamb. Lambe et al. [23] reported that the size of the hip width of the female Texel sheep at the age of ± 6 months was 28.50 cm.

Based on the results of this study it can be said that Wonosobo Sheep has a larger body frame than local sheep both thin tailed sheep and fat tailed sheep. However, when compared to Texel sheep, Wonosobo sheep body frame is smaller. This is so because the Wonosobo sheep is the result of a cross breeding between local sheep and Texel Sheep [24]. The medium body size of Wonosobo sheep has consequences on the importance of using feeding standard different from those of the large and the small size sheep.

Table 1. Body dimension of female wonosobo sheep at different ages

Body dimension	Group of age (month)						
	1-2 (23)*	2-3 (33)*	4-7 (10)*	7-12 (17)*	12-24 (21)*	24-36 (27)*	36-48 (17)*
Body weight	24.50	31.20	32.83	38.36	40.17	43.84	44.59
Heart girth (cm)	59.57	68.14	74.34	79.12	79.61	81.32	80.89
Chest width (cm)	14.35	16.70	17.77	19.09	19.13	20.15	19.49
Chest depth (cm)	23.05	26.06	27.22	29.18	29.21	31.41	30.74
Body length (cm)	52.35	59.66	63.11	66.25	67.83	68.84	69.64
Wither height (cm)	48.70	55.23	56.30	59.07	60.04	61.52	62.19
Hip Height (cm)	50.31	56.59	58.42	61.12	61.38	63.16	63.97
Hip width (cm)	13.96	16.90	17.90	20.02	20.98	21.00	20.20

*) figures in the bracket are number of samples

3.3. Ewes productivity

The data collected showed that Wonosobo ewes were first mated at 9.84 months of age. This age was comparable with the finding of [1] showing that Garut ewes were mated for the first time at the age of 9.57 months. Prabowo [13] claims that small ruminants such as goats and ewes should be mated for the first time at the age of 10-12 months.

Wonosobo ewes gave birth for the first time at the age of 15.86 months. Being associated with the age at first mating, it can be concluded that the ewes ewes was not pregnant at the first mating, they were pregnant after the second or third mating.

The litter size of Wonosobo ewes was 1.45. This figure was higher than that of thin tailed ewes, but lower than that of Texel ewes. Sumeidiana [25] reported that the thin tailed ewes had litter size of 1.39. Schmidova et al. [26] reported that Texel ewes had 1.54 litter size. According to [27] litter size can be influenced by several factors including genetic and feed.

The lambing interval of Wonosobo ewes was 9.48 months. This interval was longer than that of the thin tail sheep. Utomo et al. [28] reported that the thin tailed ewes in Brebes District, Central Java had 8.62 months lambing interval. The long lambing interval was resulted from the fact that the farmers began placing the ewes with rams 3 months after giving birth. This caused delay in pregnancy and a longer lambing interval. Ngadiono et al. [29] stated that one of the factors that influence the lambing interval was the first mating after birth.

The birth weight of Wonosobo lambs was 2.81 kg. This was greater compared to the results of the study by [30] who found that birth weight of Garut lambs was 2.7 kg. Rismayanti [16] stated that the standard birth weight of local lamb which are used as a baseline in selecting superior seeds for breeding is 2.2 kg. Harahap [31] states that high birth birth weights can show that weaning weights will be high in lambs.

The average weaning weight of Wonosobo lambs at the age of 90 days was 23.11 kg. The weaning weight of single birth lambs was 26.06 kg, while the twin was 21.14 kg. Weaning weights in this study were greater when compared to Priangan Sheep and Fat Tail Sheep. Rahmat [32] reported that weaning weights on female Priangan lambs of a single birth type was 9.97 kg and the twin was 8.00 kg. Ashari et al [6] reported that the range of weaning weights in female fat tail lambs was 7.49-9.16 kg. According to [33], that the range of live weight of female Texel sheep at the age of 10-14 weeks was 23.44-29.08 kg.

4. Conclusion and recommendation

It is concluded that female Wonosobo sheep had medium body size, bigger than local Indonesian breed but smaller than Texel breed, which were the genetic sources for Wonosobo sheep. The productivity of Wonosobo ewes were good. A further study on Wonosobo sheep is needed to develop this breed as a meat producer.

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