

## PRODUCTIVITY OF TWO PHAN RANG SHEEP LINES: THE THIRD GENERATION

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### ABSTRACT

Two experiments were conducted to determine the productivity of two Phan Rang lines at the third selected generation. The first experiment (Exp.1) evaluated the productivity of third generation fluff wool sheep and the second experiment (Exp.2) evaluated the productivity of third generation braided wool sheep. In Exp.1, In Exp.1, total of 440 lambs borned from 336 ewes resulted from breed 373 female lambs and 37 male lambs at 9 months of age. In Exp.2, total of 220 lambs borned from 167 ewes resulted from breed 185 female lambs and 19 male lambs at 9 months of age. In Exp.1, White color, fluffy, not sticky was 100%. The body weight of lambs at birth, 3, 6 and 9 months of age were 2.7; 14.42; 20.29; and 26.75 kg, respectively. The body weight of male lambs at every months of age was significantly ( $P<0.001$ ) higher than that of female lambs. The age at first lambing was 439 days, litter size was 1.32 heads per litter. In Exp.2, the body weight of lambs at birth, 3, 6 and 9 months of age were 2.50; 14.38; 20.09; and 25.43 kg respectively. The body weight of male lambs at every months of age was significantly higher than that of female lambs. The age at first lambing was 437.4 days, litter size was 1.33 heads per litter.

**Keywords:** *Phan Rang sheep, body weight, weight gain, age at first lambing, litter size.*

### INTRODUCTION

Sheep are herbivorous livestock that can endure hardships, and make good use of poor quality, low-nutrient feeds that other livestock often choose. Sheep have the ability to adapt and endure hardships better in difficult livestock areas and the effects of climate change (Otchere, 2009). Compared to countries with potential for sheep farming development, Vietnam has low sheep farming development, with an average of 637 people raising 1 sheep; Australia has 1 person raising 2.95 sheep, New Zealand has 1 person raising nearly 5.85 sheep, Mongolia has 1 person raising 9.79 sheep, ... (FAOSTAT). Developing sheep farming in Vietnam today is appropriate, in line with the trend of climate change and the effects of drought. In livestock areas, when other livestock are heavily affected such as Ninh Thuan and Binh Thuan, sheep still stand firm and develop. In the future, with the current trend of environmental change, sheep farming will not only be limited to the South Central region but will need to be developed in many other provinces such as the Central Highlands, the East and the Southwest, and even the central and northern mountainous provinces of Vietnam. Developing sheep breeds, increasing the scale, increasing the breed structure, expanding the breed level and developing branches and sets of sheep breeds are necessary to meet the current development trend and future sheep farming.

Although the current Phan Rang sheep herd adapts well to local conditions, but its productivity is not high, the breeding herd is not well managed, the male and female sheep are not pedigree monitored, and natural breeding is used without control, free exchange and purchase for breeding, especially male sheep are often used in the same herd for many generations, so the phenomenon of inbreeding appears widespread and popular among livestock farmers, leading to the loss of productivity, low meat yield, poor reproductive performance. In fact, in the Phan Rang sheep herd, the wool characteristics are clearly separated and expressed, and in which the characteristics of fluff and braided wool are easily recognized in the same breeding herd, so selective separation is highly feasible. In Vietnam's

conditions and even in the future, sheep with these wool types will react differently to the environment, leading to different adaptability and development, different breeding efficiency and adaptation to different breeding areas. The separation of the two groups of down and braided hair on Phan Rang sheep into two separate sheep lines also creates favorable conditions for more favorable breeding management, creating good raw materials and a foundation for applying and exploiting hybrid advantages in sheep breeding.

The objective of this study was to determine the productivity of two Phan Rang sheep lines (fluff and braided wool sheep) at the third generation.

## **MATERIALS AND METHOD**

### **Location and time**

The trial was conducted from March 2023 to November 2024, at Ninh Thuan Goat and Sheep Breeding Station belonging to Sontay Goat and Rabbit Research Centre in Central Region of Viet Nam.

### **Research content**

Experiment 1: Productivity of the third generation fluff wool sheep line

Experiment 2: Productivity of the third generation braided wool sheep line

### **Experimental design and methods**

Select and build the second generation sheep flock for breeding:

Select the second generation woolly rams (37 fluff wool rams and 19 braided wool rams) to be the breeding males for the third generation. Rams were selected according to the following criteria: Beautiful appearance, characteristics of the breed and body weight at 9 months of age  $\geq 35$  kg/head.

Select the second generation woolly ewes (373 fluff wool ewes and 185 braided wool ewes) to be the breeding females for the third generation. Ewes were selected according to the following criteria: Beautiful appearance, characteristics of the breed and body weight at 9 months of age  $\geq 23$  kg/head.

Mating the selected woolly rams and woolly ewes according to wool line to build the third generation sheep.

### **Data collection**

Body weight changes of third generation lambs by month of age: Body weight of lambs were weighed at birth, 3, 6 and 9 months of age by Nhon Hoa scale.

Characteristics of wool was observed at 9 months of age.

Reproductivity of third generation ewes: Age at first mating, age at first lambing, gestation time and litter size were collected.

### **Data and statistical analysis**

The data from the experiment were analyzed by analysis of basic statistic for all parameters and variance using the ANOVA of General Linear Model, while Tukey test was used to compare the means of body weight of two genders of Minitab Reference Manual Release 16.2 (Minitab, 2010).

**RESULTS AND DISCUSSION**

**Experiment 1: Productivity of the third generation fluff wool sheep line**

*Body weight changes of third generation fluff wool lambs by months of age*

The weight changes of third generation fluff wool lambs born at different ages are presented in Table 1. The results of Table 1 show that third generation fluff wool lambs had weights at birth, 3, 6 and 9 months of age of 2.70; 14.42; 20.29; and 26.75 kg/head, respectively. The weight of the rams was always higher than that of the ewes at all collected times (P<0.001).

Table 1. Body weight changes of third generation fluff wool lambs (kg/head) by month of age

Parameters	Gender	n (head)	Mean	SE	CV (%)	Min	Max
Birth weight	Female	222	2.65	0.00733	4.12	2.40	2.80
	Male	218	2.75	0.00743	3.99	2.50	2.90
	Average two gender	440	2.70	0.005	4.46	2.40	2.90
Weaning weight at 3 months of age	Female	222	13.95	0.0474	5.07	12.50	15.90
	Male	207	14.92	0.0492	4.74	13.50	16.80
	Average two gender	429	14.42	0.041	5.96	12.50	16.80
Weight at 6 months of age	Female	222	19.01	0.0515	4.04	17.60	20.40
	Male	199	21.72	0.0535	3.47	20.30	23.00
	Average two gender	421	20.29	0.076	7.66	17.60	23.0
Weaning weight at 3 months of age	Female	222	24.70	0.0432	2.61	23.40	26.20
	Male	196	29.08	0.0379	1.83	28.20	30.00
	Average two gender	418	26.75	0.11	8.47	23.40	30.0

Similar to first and second generation fluffy wool sheep, the weight results of third generation wool sheep at all collected times were relatively high compared to the survey results on mass flocks raised in 4 districts of Ninh Thuan province (Do Chien Thang et al., 2020) at the time points of newborn (2.1kg compared to 2.7kg), 3 months (11.3kg compared to 14.42kg), 6 months (16.1kg compared to 20.29kg) and 9 months of age (20.5kg compared to 26.67kg). This result is also significantly higher than the survey results of Nguyen Huu Van et al. (2023) on the mass flock of Phan Rang sheep of males at the time of birth (2.44kg vs. 2.75kg) and 3 months (13.88kg vs. 14.92kg) and of females at the time of birth (2.25kg vs. 2.65kg), 3 months (12.56kg vs. 13.95kg), and 9 months of age (22.81kg vs. 24.70kg) in Ninh Thuan province. The third generation Phan Rang fluffy wool sheep in this study had a higher birth weight than the Menz and Horro sheep (Ethiopia) male and female at 2.38 and 2.22 kg (Awgichew, 2000); the West African dwarf sheep (Djallonke sheep) at 1.67-2.70 kg (Adjibode et al., 2017); and equivalent to the Abou-Delik sheep (Egypt) at 2.29-2.81 kg (Farrag, 2022). This result is also higher than the publication of Ngo Thanh Vinh (2014) when studying Phan Rang sheep raised in Ninh Thuan and Ba Vi, ranging from 2.3 kg (female) to

2.4 (male). The higher results in this study may be due to the fact that the sheep were selected and raised according to better technical processes than in the surveyed households.

However, this result is lower than the Karayaka sheep breed (Uluta et al., 2010); Balouchi-New Zealand (Norouzian, 2015); Awassi in Jordan (Al-Momani et al., 2020) were all >3kg.

At 3 and 6 months of age, the weight of sheep in this survey was also within the range of data published by Ngo Thanh Vinh (2014) and Bui Van Loi (2014) when raised in Ninh Thuan, Ba Vi and Thua Thien Hue (10.9-14.6 kg at 3 months of age and 15.3-20.8 kg at 6 months of age). Also according to Ngo Thanh Vinh (2014), Phan Rang sheep raised in Ninh Thuan and Ba Vi at 9 and 12 months of age had a weight of 21.02-23.34 kg and 24.74-29.53 kg, respectively.

### ***Reproductivity of third generation fluff wool ewes***

The reproductive results of third generation fluff wool ewes are presented in Table 2. The results show that the age at first mating and the age at first lambing of third generation fluff ewes are 290 and 439 days, respectively. The average gestation time is 149.76 days; the lambs give birth to 1.32 lambs/litter.

Table 2. Reproductivity of third generation fluff wool ewes

<b>Parameters</b>	<b>n (head)</b>	<b>Mean</b>	<b>SE</b>	<b>CV (%)</b>	<b>Min</b>	<b>Max</b>
Age at first mating (day)	150	289.53	0.22	1.00	285	297
Age at first lambing (day)	150	439.29	0.24	0.72	433	446
Gestation time (day)	150	149.76	0.09	0.81	148	152
Litter size at birth (head/litter)	75	1,33	0,06	35,58	1	2

The age at first mating of third generation fluffy wool ewe are lower than that of studies in India on Pattanam adu sheep (Sundaramoorthy et al., 2021) at 12-13 months; of Harini et al. (2019) on Nellore Palla sheep at 361.5±1.09 days. Dinh Van Binh and Ngo Thanh Vinh (2010) reported that Phan Rang sheep raised in Son Tay had the first gestation age of 299 days.

In this study, the gestation time of third generation fluffy wool sheep was 149.76 days, similar to the published results of Nguyen Huu Van et al. (2023) of 150 days, but higher than the published results of Dinh Van Binh and Ngo Thanh Vinh (2010) of 148.9 days. According to Rusyad (1977), the gestation period was 148-150 days in Priangan sheep, 150 days in fat-tail sheep and 149 days in their crossbreds.

In this study, the age at first lambing of third generation fluffy wool sheep was 439.29 days and the sheep gave birth to 1.33 lambs/litter, higher than the published 1.25 lambs/litter by Dinh Van Binh and Ngo Thanh Vinh (2010).

### **Experiment 2: Productivity of the third generation braided wool sheep line**

#### ***Body weight changes of third generation braided wool lambs by months of age***

Body weight changes of third generation braided wool lambs born at different ages are presented in Table 3. The results of Table 3 show that third generation braided wool lambs had body weights at birth, 3, 6 and 9 months of age of 2.50; 14.38; 20.09; and 25.43 kg/head,

respectively. The weight of the male lambs was always higher than that of the female lambs at all collected times ( $P < 0.001$ ).

Table 3. Body weight changes of third generation braided wool lambs (kg/head) by months of age

Parameters	Gender	n (head)	Mean	SE	CV (%)	Min	Max
Birth weight	Female	108	2.46	0.010	4.40	2.20	2.60
	Male	112	2.55	0.010	4.38	2.30	2.70
	Average two gender	220	2.50	0.01	4.73	2.20	2.70
Weaning weight at 3 months of age	Female	108	13.84	0.086	6.53	11.20	15.40
	Male	98	14.96	0.068	4.50	13.40	16.00
	Average two gender	206	14.38	0.07	6.74	11.20	16.00
Weight at 6 months of age	Female	108	18.95	0.106	5.83	16.90	21.60
	Male	94	21.46	0.060	2.73	20.00	22.80
	Average two gender	202	20.09	0.11	7.78	16.90	22.80
Weaning weight at 9 months of age	Female	108	24.29	0.101	4.34	22.30	26.50
	Male	91	26.78	0.080	2.88	25.50	28.00
	Average two gender	199	25.43	0.11	6.09	22.30	28.00

Similar to first and second generation braided wool sheep, the weight results of third generation wool sheep at all collected times were relatively high compared to the survey results on mass flocks raised in Ninh Thuan province reported by Do Chien Thang et al. (2020) and Nguyen Huu Van et al. (2023). The third generation Phan Rang fluffy wool sheep in this study had a higher birth weight than the Menz and Horro sheep (Ethiopia) male and female (Awgichew, 2000); the West African dwarf sheep (Djallonke sheep) (Adjibode et al., 2017); and equivalent to the Abou-Delik sheep (Egypt) (Farrag, 2022). This result is also higher than the publication of Ngo Thanh Vinh (2014), but is lower than the reportation of Uluta et al. (2010); Norouzian (2015); Al-Momani et al. (2020).

At 3 and 6 months of age, the weight of sheep in this survey was also within the range of data published by Ngo Thanh Vinh (2014) and Bui Van Loi (2014) when raised in Ninh Thuan, Ba Vi and Thua Thien Hue (10.9-14.6 kg at 3 months of age and 15.3-20.8 kg at 6 months of age). Also according to Ngo Thanh Vinh (2014), Phan Rang sheep raised in Ninh Thuan and Ba Vi at 9 and 12 months of age had a weight of 21.02-23.34 kg and 24.74-29.53 kg, respectively.

### ***The reproductivity of third generation braided wool ewes***

The reproductive results of third generation braided wool ewes are presented in Table 4. The results show that the age at first mating and the age at first lambing of third generation braided

wool ewes are 288 and 437.4 days, respectively. The average gestation period is 149.55 days; the litter size is 1.33 lambs/litter.

Table 4. Reproductivity of third generation braided wool lambs (n=75)

Parameters	Mean	SE	CV (%)	Min	Max
Age at first mating (day)	287.89	0.29	0.87	284	299
Age at first lambing (ngày)	437.44	0.33	0.64	432	448
Gestation time (ngày)	149.55	0.20	1.14	147	150
Litter size at birth (head/litter)	1.33	0.06	35.58	1	2

The age at first mating of third generation braided wool ewe are lower than that of previous studies (Sundaramoorthy et al., 2021; Harini et al., 2019; Dinh Van Binh and Ngo Thanh Vinh, 2010)

In this study, the gestation time of third generation fluffy wool sheep was also similar to the published results of Nguyen Huu Van et al. (2023), but higher than the published results of Dinh Van Binh and Ngo Thanh Vinh (2010). In this study, the age at first lambing of third generation fluffy wool sheep was 437.44 days and the sheep gave birth to 1.33 lambs/litter, higher than the published 1.25 lambs/litter by Dinh Van Binh and Ngo Thanh Vinh (2010).

### CONCLUSION

The average body weight of third generation fluffy wool lambs at birth, 3, 6 and 9 months of age were 2.7; 14.42; 20.29; and 26.75 kg, respectively. The body weight of male lambs at every months of age were significantly higher than that of female lambs. The age at first lambing was 439 days, litter size at birth was 1.32 heads per litter.

The average body weight of third generation braided wool lambs at birth, 3, 6 and 9 months of age were 2.50; 14.38; 20.09; and 25.43 kg respectively. The body weight of male lambs at every months of age were significantly higher than that of female lambs. The age at first lambing was 437.44 days, litter size at birth was 1.33 heads per litter.

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Received date: 15/12/2024

Submitted date: 22/12/2024

Acceptance date: 30/12/2024

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