

## THE EFFECT OF DIFFERENT CAGE DENSITIES AND SEXES ON PELT QUANTITY OF NEW ZEALAND WHITE CROSSBREED RABBIT

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### Abstract

*New Zealand White crossbreed rabbit is a producer of meat and white pelt. Housing capacity and rabbitry area can affect production performance due to limited space allowance. The rate of growth of the male rabbit body weight tends to be faster than females, but is more easily experiencing stress due to its natural aggressivity, especially when kept in a cage with limited space that will ultimately have an effect on the quantity of pelt. The research aim was to study the influence of the density of cage and sex toward pelt quantity of New Zealand White Crossbreed rabbit. The research used randomized complete block design with a 3x2 factorial pattern and four groups of rabbit at weaning weight as replicates. The first factor was stocking density (K1: 1 rabbit/0,2 m<sup>2</sup>, K2: 2 rabbits/0,2 m<sup>2</sup>, K3: 3 rabbits/0,2 m<sup>2</sup>), and the second factor was sex (S1: male, S2: female). A total of 48 crossbreed rabbits of New Zealand White aged 42 days were used in this research, consisted of 24 males and 24 females. Data were analyzed with analysis of variance followed by Duncan's multiple range test. Variables observed were quantity of pelt: pelt weight, pelt thickness, and pelt area. The results showed that there was no interaction between stocking density and sex in all parameters observed. Stocking density had an effect on pelt area, but not on pelt weight and thickness. Meanwhile, sex has an effect on pelt weight, but not on pelt thickness and pelt area. The conclusion is that the male rabbit pelt is better compared with females whilst density of 1 heads/0.2 m<sup>2</sup> is better than 3 heads/0.2 m<sup>2</sup> and 2 head/0.2.*

**Key words:** cage, sex, production, pelt, rabbit.

### INTRODUCTION

New Zealand White crossbreed rabbit is widely kept by farmers in Indonesia because it has potential as a provider of lean meat compared to ruminants, as well as fertilizer and pelt that still has economic value. Rabbit breeding is generally done individually or colonies in the cage. One cage ranges between 2-10 heads (Rommers et al., 2007; Trocino and Xiccato, 2006). Optimal stocking density requirement in female and male rabbit need to be known in order to maximize the number of rabbits which are kept in cages in order to get a good performance of rabbit production, so it would obtain the quantity of good rabbit pelt.

The density of rabbit suspected of giving effect to the pelt's quantity because it will affect its body weight. Bigger body weight means big body volume, so that the pelt would be vastness. Better body weight at optimum density could maximizes the heaviness and vastness of the pelt. Pelt heaviness closely related to rabbit weight cut. In New Zealand White crossbreed rabbit with slaughter weight

1700-1900 grams will produce heavy pelt in the range of 122.73 g to 178.37 g of slaughter weight or 7.23% to 8.96% (Yurmiati, 2006). Cages with high density will cause the animal difficult to move so that there is a tendency to fat accumulation under the skin which will affect the thickness of pelt.

Local rabbits were cut at 15 weeks, weight 2274 gram, produced heavy pelt at 271 gram, and does not affected by sex (Lakabi et al., 2004), while pelt heaviness on New Zealand White crossbreed rabbit which was cut at 12 weeks and weight cut 2218 gram, namely 204±17.17 gram (Baiomy and Hassanein, 2011) higher on cage density more than 6 head/m<sup>2</sup> and on male rabbit has heavier pelt (378.5 gram) compared to female rabbit (360.48 gram) (Vilalobos et al., 2008).

Rabbit pelt has an area between 1.5 to 2.5 square feet or 0.14 – 0.23 m<sup>2</sup> (Sri Untari, 2005). Vastness of fresh pelt increased matching with pelt weight and cut weight because the bigger the rabbit means the vastness the pelt. The results of the research of Tao (1994) indicates pelt vastness of New Zealand White crossbreed rabbit by weight 3.43±0.36 kg is 1.197±94 cm<sup>2</sup>

and Rex rabbit with weight  $2.63 \pm 0.26$  kg produces pelt vastness  $972 \pm 96$  cm<sup>2</sup>. Sex affects rabbit weight and pelt vastness, which is pelt of male rabbit more vast than female rabbit,  $1273 \pm 55$  cm<sup>2</sup> and  $1122 \pm 83$  cm<sup>2</sup>.

## MATERIALS AND METHODS

Experiments using 48 New Zealand White crossbred rabbit age 6 weeks, consisting 24 male rabbits and 24 female rabbits, with weaned weight between 400-700 gram. Rabbit are placed randomly by sex in accordance with the treatment in 24 battery cage with a length of 50 cm, 40 cm wide, and 35 cm height (floor area 0.2 m<sup>2</sup>) 24 pieces that include a single nipple drinking water and feed.

Rationing and drinking water are given twice a day in *ad libitum* at 07.00 and 16.00. Rations were used in this research is commercial ration with nutrition-shaped pellet feed as listed in Table 1.

Table 1. Ration composition in the research

Feed Ingredients	Rations*	Needs**
Protein (%)	16	15
Crude Lipid (%)	5	3
Crude Fiber (%)	16	14
Ca (%)	1,36	0,5
P (%)	0,7	0,3
Ash	8	-
Digestible Energy (Kcal/kg)	2.576	2.500

\*Commercial Ration Guyofeed

\*\*Lebas, 1980 in McNitt et al., 2000

DE is calculated using a formula based on Fekete and Gilpert (1986) in Cheeke (1987):  $DE = 4253 - 32.6(\%SK) - 144.4(\%Ash)$

Slaughtering is done at the 12 weeks rabbit after fasting 6-10 hours by cutting the throat to the esophagus, carotid artery and jugular vein severed, then the pelt is removed from the body.

Measurement Variable :

- a. Pelt weight (gram)  
It obtained by weighing the rabbit's pelt shortly after debarking.
- b. Pelt thickness (mm)  
Pelt thickness is obtained by measuring pelt thickness in some areas that is Croupon, shoulder, belly and tail using

micrometer with accuracy of 0.001 mm. Sampel of pelt is shaved by using scapel to the base of fur.

- c. Pelt area (cm<sup>2</sup>)  
Pelt area is measuring length and width of Pelt and using Hegenaur method (1977). In Figure 1. Pelt are (cm<sup>2</sup>) was obtained by using the formula of length(cm) x width of the pelt (cm).

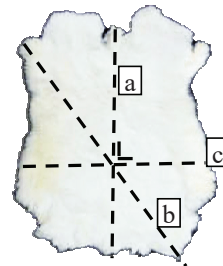


Figure 1. How to measure the length and width of pelt rabbit with Hegenaur method (1977).

- a. length
- b. diagonal help lines to gain pelt width
- c. pelt width

The design is using Randomized Block Design factorial 3 x 2 with 4 groups of weaning weight (400-700 grams) as replicates. Factors treatment is given as follows:

- 1) Cage density factor (K), consist of three level :

$$K_1 = 1 \text{ head}/0.2 \text{ m}^2$$

$$K_2 = 2 \text{ head}/0.2 \text{ m}^2$$

$$K_3 = 3 \text{ head}/0.2 \text{ m}^2$$

- 2) Sex Factor (S), i.e:

$$S_1 = \text{male}$$

$$S_2 = \text{female}$$

Based on the treatment, then obtained 6 treatment combination and each treatment was repeating 4 times, thus there are 24 units in this trial cage.

## RESULTS AND DISCUSSIONS

The result showed that cage density treatment and sex did not affect the weight and thick of pelt, but significantly affect ( $P < 0.05$ ) to pelt vastness. There were no interactions between cage density and sex against heaviness, thickness and vastness of pelt of New Zealand White crossbred rabbit (Table 2).

Table 2. The effect of cage density and sex toward the quantity of pelt of New Zealand White crossbreed rabbit

Variable	Density			Sex		Interactions
	K1	K2	K3	Male	Female	
Pelt Weight (g)	163.43 A	150.8 a	155.68 a	167.38 B	145.74 A	Ns
Pelt Thick (mm)	0.21 a	0.18 a	0.24 a	0.23 A	0.18 A	Ns
Pelt Area(cm <sup>2</sup> )	937.28 b	782.90 a	843.55 ab	840.18 A	868.97 A	Ns

K1 = 1 head/0.2 m<sup>2</sup>, K2 = 2 head/0.2 m<sup>2</sup>, K3 = 3 head/0.2 m<sup>2</sup>

Means for the same item in the same row at the same treatment are significantly different (P< 0.05)

Ns = No Significant effect

**Influence of the cage density and sex on pelt weight.** Table 2 shows that the weight of the pelt significantly (P<0.05) influenced by sex, but it is not significantly affected by the density of the cage, and there was no interaction between the density of cages and sex to the weight of the fresh pelt. This shows that the density of cages and sex do not affect each weight cut of rabbit, so it does not affect the pelt. Slaughter weight is more influenced by hormonal factors contained in the treatment of sex, so there is no influence between the density of cages and sex.

Cage density factor did not significantly affect the weight of rabbit pelt. It shows that rabbit cut weight was not influenced by the cage density so that produce weight pelt which is not significantly different. Unlike sex, highly significantly affect (P<0.01) to the weight of the rabbit pelt. This is due to male rabbits heavier than the female rabbits. The results are consistent with Yurmiati (2006) that the increase in rabbit weight cut will be followed by the increase of fresh pelt weight.

Pelt weight which was produced in this research is 167.34 gram on male rabbit and 145.74 gram on female rabbit or ranged between 7.74 – 10.75% from range of the weight cut (1570.40 up to 2235.20 grams). Pelt weight in this research was in the range that obtained by Yurmiarti (2006) on male rabbit of New Zealand White crossbreed, which is 122.73 up to 178.37 gram from the weight cut (1700 gram - 1990 gram) or 7.23 – 8.96%, while Purnama (2006) gained the weight pelt percentage in the range 10-12% toward live weight (2256 – 2956 gram) at Rex rabbit showed that cage density and sex do not significantly affect pelt thickness, as well as the interaction of both of these factors.

**Influence of cage density and sex toward pelt thickness.** The result of observation of pelt thickness of each treatment (Table 2) showed that rabbit pelt thickness with cage density is highest i.e 3 head/0.2 m<sup>2</sup> but in statistic it is not significantly different. This is due to high density which makes rabbit has low activity which causing fat accumulation under the skin, showed with high pelt thickness, but rabbit is in growth period so that fat accumulation under the skin still low and cause pelt thickness not significantly different.

Male rabbit's pelt is bigger than female rabbit's pelt, but in statistic not significantly different. This is because the rabbit is on growth period, so that fatty under the skin is not optimum yet which causing pelt thickness of male rabbit is not different with female rabbit's pelt. The thickness of the pelt is associated with the accumulation of fat in the subcutaneous and korium layer. According to Tancous et al. (1981) in the subcutaneous layer has woven fat and a place of accumulation of fat, but fat is possibly in the middle of "corium" inside separates fat cells. The fat presence inside pelt later associated with weight cut and weight fat of carcass in this research. Tao (1994) gained same results which male rabbit is significantly has thicker pelt on every skin part which is observed respectively in male and female are shoulder (2.67±0.61 and 2.51±0.42), back (2.77±0.62 and 2.65±0.59) and tail (2.92±0.59 and 2.92±0.60).

**The effect of cage density and sex towards pelt area.** The observation toward pelt area showed that pelt area of rabbit is significantly influenced (P<0.05) by cage density but not significantly influenced by sex, and there was no interaction between both factors. It indicates that pelt area of the rabbit in all treatment of

cage density is same to male and female rabbit. The absence of interaction because the rabbit is still in growth period so that its pelt is not yet fully developed which led to vastness of the pelt is not affected by cage density and sex. Maynard and Loosli (1969) explained that the change in pelt is closely related to the growth that will result in increasing on body volume so that the pelt which wrapped around the body surface will be more broadly follows body size of the rabbit.

The result obtained in this study are not in line with Maynard and Loosly (1969), that the increase in weight cut of the rabbits will be followed by increasing rabbit pelt's area. The results obtained in this study also inversely proportional to the statement of Tao (1994) that the sex effect on body weight and pelt area, where the male rabbit has more pelt area ( $1273 \pm 55 \text{ cm}^2$ ) than the female one ( $1.122 \pm 83 \text{ cm}^2$ ), both in Rex and New Zealand White crossbreed rabbits. It may be caused by differences in age and rabbit's type which are used in the maintenance to produce pelt. This research used New Zealand White crossbreed rabbit with final low body weight (1585.89 - 1909.05 gram) and was aged 12 weeks when cutting, while Tao (1994) used pure breeds rabbit with cut weight 5 months so that have bigger body weight with the average weight of 3.43 kg.

## CONCLUSIONS

There is no interaction between the cage density and sex toward quantity of the pelt (heavy, thick, and area of pelt) of New Zealand White crossbreed rabbit. Cage density affects the wide of pelt of New Zealand White crossbreed rabbit but does not affect on its heaviness and thickness. Sex affects pelt heaviness of New Zealand White crossbreed rabbit but does not affect pelt thickness and vastness.

## REFERENCES

- ARBA, 2006. ARBA Recommendations for the Care of Rabbits and Cavies.
- Baiomy, A.A., H.H.M. Hassanien, 2011. Effect of Breed and Sex on Carcass Characteristic and Meat Chemical Composition of New Zealand White and Californian Rabbits under Upper Egyptian Environment. *Egyptian Poultry Science*, Vol. 31(II):275-284.
- Cheeke, P.R., 1987. *Rabbit Feeding and Nutrition*. Oregon: Academic Press, Inc.
- Council of Europe, 2004. *European Convention for the Protection of Vertebrate animals used for Experimental and Other Scientific Purposes (ETS 123)*. Strasbourg: Council of Europe.
- Purnama D.R., 2006. *Evaluasi Karkas Dan Kulit Bulu (Fur) Kelinci Rex Jantan Pada Berbagai Umur Potong*. Temu Teknis Nasional Tenaga Fungsional Pertanian 2006 – Pusat Penelitian dan Pengembangan Peternakan, Bogor.
- Grace T.I.E, S.A.S. Olorunju, 2005. Effect of Stocking Density on Performance of Growing Rabbits in the Semi-humid Tropics. *Tropicultura Journal*, 23(1):19-23.
- Yurmiarti Husmy, 2006. Hubungan Berat Potong dengan Berat, Luas dan Tebal Pelt Kelinci. *Jurnal Ilmu Ternak*, Juni 2006, Vol. 6, No. 1.
- Judoamidjojo M., 1981. *Dasar Teknologi dan Kimia Kulit*. Jurusan Teknologi Industri, Fakultas Teknologi Pertanian, IPB, Bogor.
- Lebas, F., P. Coudert, R. Rouvier, H. De Rohambeau, 1996. *The Rabbit Husbandry, Health and Production*. Rome :FAO Animal Production and Health Series No. 21.
- Mousa-Balabel T.M., 2009. Effect of cage versus pen and stocking density on behaviour and performance in rabbit. *Online Journal of Veterinary Research*, Vol. 13(2):48-55.
- National Research Council (NRC), 2011. *Guide for the Care and Use of Laboratory Animals*. 8th Ed. Washington: National Academy Press.
- Onbasilar E.E., I. Onbasilar, 2007. Effect of Cage Density and Sex on Growth, Food Utilization and Some Stress Parameters of Young Rabbits. *Scandinavian Journal of Laboratory Animal Science*, Vol 34, No. 3.
- Rommers J., M. van Galen, E. Bokkers, 2007. De productie van en handel in konijnenbont in de Europese Unie Wetenschapswinkel Wageningen UR. *Rapport 236*.
- Sri Untari, 2005. *Penyamakan Kulit Kelinci Dengan Teknologi Tepat Guna Sebagai Bahan Kerajinan Kulit Dan Sepatu Dalam Menunjang Agribisnis Ternak Kelinci*. Prosiding Lokakarya Nasional Potensi dan Peluang Pengembangan Usaha Kelinci. Pusat Penelitian dan Pengembangan Peternakan. Bogor.
- Tancous J.J., W.T. Roddy, F.O'Flaherty, 1981. Defek-defek pada Kulit Mentah dan Kulit Samak. *Terjemahan R. M. Judoamidjojo*. Jakarta: Bhratara Karya Aksara.
- Tao Y.R., 1994. Studies on the Quality of Rex Rabbit Fur. *World Rabbit Science*, 2 (1):21-24.
- Trocino A., G. Xiccato, 2006. Animal Welfare in Reared Rabbits: A Review with Emphasis on Housing Systems. *World Rabbit Sci.*, 14:77-93.
- Villalobos O., O. Guillén, J. García, 2008. Effect of cage density on performance of fattening rabbits under heat stress. *Proceeding of 9<sup>th</sup> WRSA*, 1631-1636.



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