

Performances of Debu and Kelabu Sentul Hens in the Different Rearing System at *Poultry Breeding Development Center Jatiwangi Majalengka*

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Abstract. The pattern of raising domestic chickens in Indonesia is still maintained traditionally, used as a side business and savings. Besides that, Domestic chickens still have high broodiness, slow growth, and reproduction rates, so changes are needed in the rearing system. Observations and data collection were carried out at Poultry Breeding Development Center Jatiwangi. Debu and Kelabu Sentul hens have reached the age of 29 weeks in the deep litter system, and colony cages were observed for three months by observing egg production, FCR, and Depletion. Debu Sentul hens reared in the deep litter systems had lower egg production, higher FCR, and Depletion (28.34%, 9.34, 21.05%, respectively) than those reared in colony cages (36.08%, 7.04, 4.76%, respectively). Kelabu Sentul hens reared in the deep litter systems had lower egg production, higher FCR, and Depletion (24.64%, 12.01, 15.51%, respectively) than those reared in colony cages (41.64%, 6.06, 10.86%, respectively). In conclusion, the performance of Kelabu and Debu Sentul hens reared in colony cages was better than in deep litter system cages. The performance of Kelabu Sentul hens reared in colony cages was better than Debu Sentul hens.

1 Introduction

Domestic chicken is a type of Indonesian poultry that comes in various clumps, including Kedu chicken, Sentul chicken, Pelung chicken, Cemani chicken, Kokok Balenggek chicken, and others. Domestic chicken has a distinct flavor with chewy meat and low-fat content. Domestic chicken also boasts high selling value, making them popular among Indonesians. Furthermore, domestic chickens are highly adaptable. Based on [1], Sentul chicken shows the appearance and morphology as a dual-purpose type of local chicken.

The pattern of raising domestic chickens in Indonesia is still maintained traditionally, used as a side business and savings. It has an impact on the small number of populations that farmers keep. In addition, Domestic chickens still have high broodiness, slow growth,

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and reproduction rates. According to [2], almost all of Indonesia's native chicken breeds have low production and reproduction rates. They have a moderate growth rate and a low feed efficiency. So changes are needed in the rearing system.

Poultry Breeding Development Center Jatiwangi is one of the centers dedicated to preserving and developing West Java's native genetics, especially the Sentul chicken. Maintenance management, housing, feeding and drinking, reproductive management, health management, waste management, and production performance must be considered when producing Sentul chicks to create high-quality Sentul chickens [3].

This study aims to examine the performance of Sentul Debu and Kelabu chickens rearing in different cages.

2 Methods

2.1 Location

Observations and data collection were carried out at Poultry Breeding Development Center Jatiwangi. It is located in Majalengka Regency, West Java Province.

The Poultry Breeding Development Center Jatiwangi has a land area of 16.5 Ha owned by the West Java Provincial Government and has a right to use certificate no. 324 of 1989. The land is used for office purposes (17,802 m²), Sentul chicken raising (24,750 m²), and duck raising (25,974 m²). Rice fields or fields and cliffs are examples of unused land. Poultry Breeding Development Center Jatiwangi has a hall, a service room, an official residence, a barracks, a hatchery, a prayer room, and a warehouse.

2.2 Data collection

The information gathered was based on both primary and secondary sources. Primary data was obtained through direct observation, while secondary data was obtained through interviews and agency data. The data collected is related to the report, specifically housing data, feeding and drinking, lighting, livestock reproduction, egg collection, livestock selection, livestock transfer, livestock health, maintenance performance, livestock waste, and production distribution.

2.3 Observed variable

Debu and Kelabu Sentul hens were reared in the deep litter system and colony cages. Debu and Kelabu Sentul hens that have reached the age of 29 weeks were observed for three months of rearing by observing Hen Day Production, FCR, and Depletion. Hen Day Production was measured using egg production and chicken population. FCR was calculated based on feed consumption and egg production weight. Depletion was the percentage of the population of chickens that died or were culled. According to [4], the formula for calculating HDP, FCR, and Depletion is as follows:

$$HDP = \frac{\text{Total egg production}}{\text{Total population}} \times 100\% \quad (1)$$

$$FCR = \frac{\text{Feed consumption}}{\text{Total egg production} \times \text{average egg weight}} \quad (2)$$

$$\text{Depletion} = \frac{\text{Total population were died and culled}}{\text{Total population}} \times 100\% \quad (3)$$

3 Result and discussion

3.1 Rearing Management

Poultry Breeding Development Center Jatiwangi aspires to be a reliable center and facilitator in the management and provision of seeds and the transfer of advanced local chicken and duck management technology in Indonesia, leading to an independent, dynamic, and prosperous West Java community. One of the goals of the Poultry Breeding Development Center Jatiwangi is to preserve domestic chicken and duck lines as germplasm in West Java. Sentul chicken is one of the leading domestic chicken lines in West Java. Existing Sentul chickens include Debu Sentul chickens and Kelabu Sentul chickens, raised in stages similar to local/breed chickens in general, namely the starter, grower, and layer period.

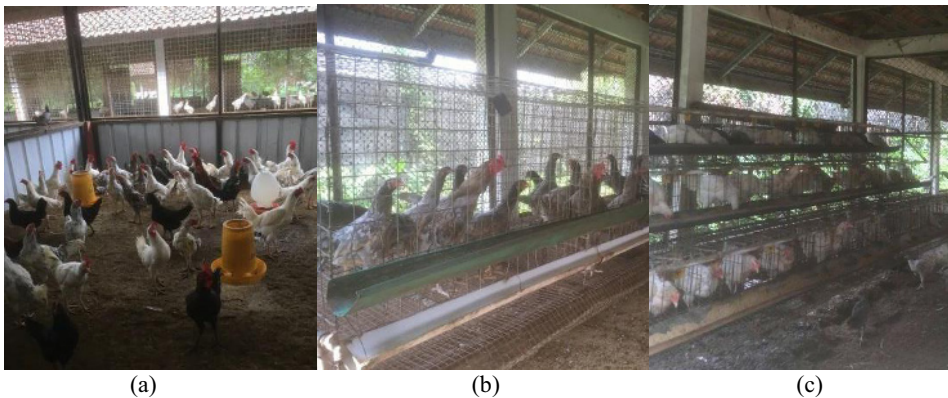
3.1.1 Housing

The housing system used at the Poultry Breeding Development Center Jatiwangi for rearing Debu and Kelabu Sentul Hens are open houses with a deep litter system, colony cages, and battery cages (fig. 1). The cage connects west and east. The shape of the roof used varies depending on the cage form. Colony cages have a monitor roof, whereas the deep litter systems and battery cages have a gable roof. The floor of the cage used in each cage is a litter system with husks at the cage's base.

The Poultry Breeding Development Center's cage density ranges from 3-6 birds/m², referring to [5] as many as six birds/m². The colony cage at the Poultry Breeding Development Center meets the minimum area requirement for chickens. Table 1 displays the cage's area and capacity. Based on Table 1 and the cage's reference density, the population of chickens kept for each available cage still needs to be increased.

Table 1. The area and capacity of the layer phase maintenance cage

Building	Type	Size (m ²)	Total cages (pcs)	Cages capacity (birds)	Housing capacity (birds)	Population (birds)
A1	colony cages	50	18	6	108	106
A2	deep litter system	20	-	-	120	66
A3	battery cages	40	126	1	126	81
B1	deep litter system	20	-	-	120	86
B2	colony cages	329	176	6	1056	578
B3	deep litter system	20	-	-	120	71
C1	colony cages	189	96	6	576	368
C2	colony cages	406	140	6	840	104
C3	deep litter system	20	-	-	120	102
D1	colony cages	189	96	6	576	358
D2	colony cages	392	212	6	1272	232
D3	deep litter system	20	-	-	120	119
E1	colony cages	189	21	6	126	60
E2	deep litter system	32	-	-	192	68
F1	deep litter system	20	-	-	120	63
F2	deep litter system	20	-	-	120	72

**Fig. 1** (a) Deep litter systems (b) Colony cages (c) Battery cages

3.1.2 Feeding management

Debu and Kelabu hens reared at the Poultry Breeding Development Center Jatiwangi are fed daily using a restricted feeding system. The feed was given on a limited basis and provided commercial seed chicken feed. Every day, 100 grams of feed were given to each head. A hanging feeder with 3-4 pieces per flock is used in the deep litter system cage. In battery cages and colony cages, PVC feed bins are used.

Water was provided on an ad libitum basis for the treatment of Debu and Kelabu hens at the Poultry Breeding Development Center Jatiwangi. The water supply is groundwater that was previously stored in a water tower. There are numerous drinking water locations. The deep litter system cage has a gallon capacity of 7 liters that is changed twice a day and an automatic drinking water container that is cleaned once a week. Nipple drinkers are used in battery cages and colony cages.

The feed provided is obtained through an auction. There was a change in the feed given at the time of the research because the quality of the feed was being prepared for the next feed auction during the trial period. Efforts are made to prevent stress caused by feed changes, and adaptation is carried out by gradually mixing old feed with new feed. Table 2 compares the nutritional content of the old (feed A) and new (feed B) feeds.

Table 2. The content of nutrients needed and the nutritional content given to hens

Number	content of nutrients	Unit	Requirements	Feed A	Feed B
1	Water level (max)	%	14	13	13
2	Crude protein (min)	%	16	15-17	18
3	Crude fat (min)	%	3	4	3
4	Crude fiber (max)	%	8	6	7
5	Total ash (max)	%	14	13.5	14
6	Calcium (Ca)	%	2.75 - 4.25	3.5	3.25 - 4.25
7	Phospor(P) total	%	0.6 -1	0.7	0.6
8	Aflatoxin (max)	µg/kg	50	20	50
9	Metabolism Energy (ME) (min)	kcal/kg	2500	2700	2700

Source: BSN (2013)

The nutrition of the feed provided was following the standards established by [6].

3.1.3 Lighting

The layer phase of Debu and Kelabu Sentul Chicken at Poultry Development Center Jatiwangi receives natural lighting for 12 hours per day. The chickens in the colony cages were exposed to additional light for 5-7 hours during the night. From 9 p.m., additional lighting is provided. This treatment is given to the chickens to be active at night. In the cage, there are about 6-10 lights. The lamp is an 18-watt fluorescent lamp and a 28-watt bulb with 50 lx intensity.

3.1.4 Management of reproduction

Debu and Kelabu Sentul chickens in the layer phase at the Poultry Breeding Development Center Jatiwangi had a male to female ratio of 1:5 in deep litter systems and colony cages. Each cage type has a different mating system for Debu and Kelabu Sentul chickens in the layer phase at Poultry Breeding Development Center Jatiwangi. Chickens used natural mating in deep litter systems and colony cages. Chickens in battery cages are mated using artificial insemination. Artificial insemination was performed on Sentul chickens in one line and between lines. Artificial insemination of a single line is used to obtain replacement stock with pure blood from Debu Sentul or Kelabu Sentul chickens. Artificial insemination between strains is used to produce crossbred chickens from the selection of both Debu and Kelabu lines and to facilitate the evaluation of each seedling (seed value index). Artificial insemination occurs twice a week, on Tuesdays and Fridays. The semen used in Artificial Insemination is liquid semen collected and diluted before the procedure. The sperm was diluted in a 1:2 ratio with 0.9% NaCl.

3.1.5 Collection and handling of eggs

Eggs from Debu and Kelabu hens are collected once a day at the Poultry Breeding Development Center Jatiwangi. The collected eggs are assigned a flock number and recorded on the daily egg recording and egg delivery sheet. Eggs are collected and placed

in the hatching room before being selected. The egg is chosen based on its weight and physical condition. Consumption eggs are eggs that do not meet the requirements for hatching. The eggs must be between 45-55 grams in weight, not cracked, have a smooth surface, and be of normal shape to hatch (ovoid).

3.1.6 Selection

Chicken selection occurs at the start of maintenance, specifically when the chicken will transfer to the cage. The poultry entering the pen is chosen based on qualitative and quantitative criteria. Bodyweight and age are two quantitative properties that are taken into account. The bodyweight of a hen ranges between 1300 and 1600 grams, while a rooster ranges between 2000 and 2600 grams. The chickens chosen were between the ages of 19 and 24 weeks. Table 3 and Figure 1 show the following qualities were considered when selecting males: coat color, gender, eye color, health, and comb shape.

Table 3. Qualitative properties of Debu and Kelabu Chickens

Criteria	Debu Sentul Chicken	Kelabu Sentul Chicken
Fur color	white dominant	grey dominant
Shank color	cream	cream/grey
Beak color	cream	grey
Eye color	orange/bright yellow	
Comb shape (rooster)	<i>single/pea comb</i>	

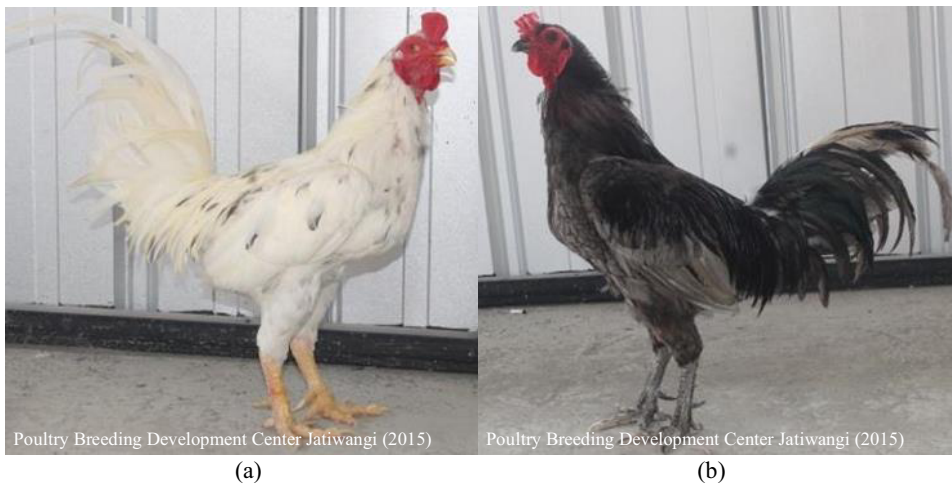


Fig. 2 (a) Debu Sentul chicken (b) Kelabu Sentul chicken

3.1.7 Transfer

Debu and Kelabu Sentul Chickens are reared with a continuous system. Transfer activities were carried out in rearing Debu and Kelabu chickens at the Poultry Breeding Development Center Jatiwangi to fill empty cages with replacement stock. Livestock transfer was carried out during the transfer of the rearing phase from the grower to the layer. Livestock transfer can also be performed during the transfer of rejected chickens. Livestock transfers are performed 2-4 times per week. When the Hen Day Production reaches 5%, the rearing cage

is transferred from the grower period to the layer period. Chickens aged more than 2-2.5 years, with a productivity of 10%, disabled or sick chickens, and having unhealthy physical characteristics are the criteria for transfer chickens to be culled.

3.1.8 Health management

Health management implementation at the Poultry Breeding Development Center Jatiwangi follows the same schedule every four months. Routine activities are carried out to take blood samples, vaccination, and administering deworming drugs. Blood samples were collected twice every four months before and after vaccination to test AI and ND antibody titers. During the layer period, Debu and Kelabu Sentul received the ND-AI vaccine. Vaccination is administered every four months. The vaccine used is an inactive vaccine injected as much as 0.5 cc into the chest muscle. The blood sampling results performed a month before and after vaccination are used to determine vaccine effectiveness. Deworming is administered two weeks before and two weeks after vaccination. Deworming is administered through feed at 2 grams per kilogram of feed.

Biosecurity were applied such as disinfection, sanitation, personal hygiene, and traffic control. Disinfection is accomplished by providing a dipping pool at both the institution's and the cage's entrances. Sanitation is accomplished by changing the litter and washing the equipment. The replacement of husks is carried out when the husks in the cage are wet and emit an unpleasant odor. The litter is usually changed every 2-4 weeks. The equipment to be washed is a drinking place with a washing frequency of twice a day for a gallon drinking water container and an automatic drinking water container every day. Personal hygiene of workers is prior before entering the cage. In addition, workers in a cage must wear masks and boots. To prevent the disease from getting out and spreading from the cage, the workers clean themselves by taking a shower. Traffic control is accomplished by limiting entry permits and regulating the cage's entry flow. Another activity is cutting grass around the cage to ensure team members' safety and minimize pests and predators.

3.1.9 Performance

Debu and Kelabu Sentul hens that have reached the age of 29 weeks were observed for three months of rearing by observing Hen Day Production, FCR, and Depletion. Hen Day Production was measured using egg production and chicken population. FCR was calculated based on feed consumption and egg production weight. Depletion was the percentage of the initial population of chickens that died or were rejected. Table 4 shows the performance of Debu and Kelabu Sentul Hens in the deep litter system.

Table 4. Performance of Debu and Kelabu Sentul Hens in deep litter system cages.

Type	Ages (Week)	Initial Total Population (birds)	Final Total Population (birds)	Total production (eggs)	HDP (%)	FCR	Depletion (%)
Debu Sentul hens	29-32	76	71	604	29,18	8,57	6,58
	33-36	71	62	414	20,07	12,46	12,68
	37-40	62	60	648	35,78	6,99	3,23
Kelabu Sentul hens	29-32	58	53	549	34,53	7,24	8,62
	33-36	53	51	211	13,10	19,09	3,77
	37-40	51	49	379	25,76	9,70	2,00

Table 4 shows the performance of Debu and Kelabu Hens reared in the deep litter system. Egg production (Hen Day Production) of Debu and Kelabu Sentul Hens that are the

age of 33-36 weeks decreased from the previous age (first month of the study) due to feeding changes in the second month of rearing. The egg production of Kelabu Sentul Hens increased again in the third month of the study (age 37-40 weeks), but not as much as the egg production of Debu Sentul hens. Debu Sentul Hens, aged 37-40 weeks, produced the most eggs, followed by Kelabu Sentul Hens, aged 29-32 weeks. According to [3], egg production is still lower than 40% that of local chickens reared in an intensive system.

According to [3], the FCR produced by Debu and Kelabu Sentul Hens in deep litter system cages is higher than the FCR produced by local chickens reared with an intensive system of 4.9 - 6.4. The high FCR is caused by a change in feed, which causes the chickens to adapt to the new feed, resulting in a decrease in egg production. Furthermore, a high FCR rate can occur when a lot of feed is scattered around the area due to chickens scrambling to eat, and the nature of local chickens is still aggressive.

The depletion rate of Debu and Kelabu Hens in deep litter system cages was quite high. The high Depletion rate was caused by the large number of chickens that died after becoming infected by worms. According to [7], the primary prevention of worm infection is regular cage sanitation by cleaning chicken manure. The transmission mechanism is through worm eggs that come out with feces and are then eaten by other chickens. It is highly recommended that the cage be disinfected regularly.

Table 5 shows the performance of Debu and Kelabu Hens reared in colony cages.

Table 5. Performance of Debu and Kelabu Hens reared in colony cages

Type	Ages (Week)	Initial Total Population (birds)	Final Total Population (birds)	Total production (eggs)	HDP (%)	FCR	Depletion (%)
Debu Sentul hens	29-32	42	42	408	34,69	7,21	0,00
	33-36	42	40	402	31,14	8,03	4,76
	37-40	40	40	509	42,42	5,89	0,00
Kelabu Sentul hens	29-32	46	45	562	43,84	5,70	2,17
	33-36	45	43	606	45,19	5,53	4,44
	37-40	43	41	460	35,91	6,96	4,65

Table 5 shows that the third month's production of Kelabu Sentul hens was lower than the previous two months. It is due to a damaged cage, which causes uneven feeding. In general, egg production of Kelabu Sentul hens was higher than that of Debu Sentul hens when reared in a colony cage. Egg production increased by 41.61% when fed the same nutrient content. [8]

The FCR produced by Debu and Kelabu hens in colony cages was higher than the study's [8] result of 5.17. The high FCR is due to the lack of weighing the remaining feed, which means that the actual amount of feed consumed is unknown.

The depletion rate of Kelabu Sentul hens in colony cages was higher than Debu Sentul hens. The high rate of Depletion was due to death caused by cannibalism. Cannibalism is triggered by feather pecking behavior, which is common in colony rearing systems, according to [9]. This behavior can be caused by both internal (genetic) and external (environmental) factors (environment and feed). Some efforts that can be made to prevent the appearance of feather pecking behavior in a chicken farm include genetic improvement efforts, beak cutting, a better feed management approach, and a better cage and environmental management approach.

Table 6 shows the performance of Debu Sentul hens reared in deep litter systems and colony cages.

Table 6. Performance of Debu Sentul hens reared in deep litter systems and colony cages

Type	Ages (Week)	Initial Total Population (birds)	Final Total Population (birds)	Total production (eggs)	HDP (%)	FCR	Depletion (%)
Deep litter systems	29-32	76	71	604	29,18	8,57	6,58
	33-36	71	62	414	20,07	12,46	12,68
	37-40	62	60	648	35,78	6,99	3,23
Koloni cages	29-32	42	42	408	34,69	7,21	0,00
	33-36	42	40	402	31,14	8,03	4,76
	37-40	40	40	509	42,42	5,89	0,00

Table 6 shows that Debu Sentul hens' egg production in deep litter systems was lower than that of those reared in colony cages. According to [10], maintenance on battery cages is more effective and efficient than other maintenance systems. According to [11], Birds in the cages produced significantly higher rates and laid heavier eggs than those on deep litter systems. Based on [12], although productivity in alternative systems is frequently lower than in conventional, intensive layers, eggs from alternative systems have been shown in numerous studies to have better nutritional properties. Debu Sentul hens reared in colony cages had lower FCR and depletion rates than Debu Sentul hens reared in deep litter systems, implying that Debu Sentul hens reared in colony cages performed better than Debu Sentul hens reared in deep litter systems.

Table 7 shows the performance of Kelabu Sentul hens reared in deep litter systems and colony cages.

Table7. Performance of Kelabu Sentul hens reared in deep litter systems and colony cages.

Type	Ages (Week)	Initial Total Population (birds)	Final Total Population (birds)	Total production (eggs)	HDP (%)	FCR	Depletion (%)
Deep litter systems	29-32	58	53	549	34,53	7,24	8,62
	33-36	53	51	211	13,10	19,09	3,77
	37-40	51	49	379	25,76	9,7	2,00
Colony cages	29-32	46	45	562	43,84	5,7	2,17
	33-36	45	43	606	45,19	5,53	4,44
	37-40	43	41	460	35,91	6,96	4,65

Table 7 shows that Kelabu Sentul hens' egg production in deep litter systems was lower than that of those reared in colony cages. According to [10], maintenance on battery cages is more effective and efficient than other maintenance systems. According to [11], Birds in the cages produced significantly higher rates and laid heavier eggs than those on deep litter systems. Based on [12], even though productivity in alternative systems is frequently lower than in conventional, intensive layers, eggs from alternative systems have been shown to have better nutritional properties. Kelabu Sentul hens reared in colony cages had lower FCR and depletion rates than Kelabu Sentul hens in deep litter systems. Implying that Kelabu Sentul hens reared in colony cages performed better than Kelabu Sentul hens reared in deep litter systems.

3.2 Waste management

The waste generated by raising Debu and Kelabu chickens at the Poultry Breeding Development Center Jatiwangi is solid waste. Carrion and litter are the main types of solid waste produced. Every day, solid waste in the form of carrion is collected from each cage

and burned in an incinerator, and if capacity is exceeded, the carrion is buried. At the time of cleaning the cage, solid waste in the form of litter is collected in sacks, and the litter sacks are then used as fertilizer for agriculture around the hall.

3.3 Production and Distribution

The Poultry Breeding Development Center has a production distribution program, which includes a grant of 50,000 Sentul chicken seeds in the form of DOC for farmer groups. This program's expected outcome is the ability to print brood hens in the area. The livestock group that received the DOC grant received 1,000 DOC, starter period feed, and a package of medicines and disinfectants.

As a result of production, the Poultry Breeding Development Center Jatiwangi provides chicken eggs, DOC, and rejected chickens. The price of chicken eggs sold at BPPT Unggas Jatiwangi is arranged in [13], with whole chicken eggs costing IDR 1000 and cracked chicken eggs costing IDR 500. Rejected chickens are priced at IDR 25000 for young rejected chickens and IDR 20.000 for adult rejected chickens.

4 Conclusion

They were rearing Debu and Kelabu hens at Poultry Breeding Development Center Jatiwangi intensively in open house cages. The population in the cage is still below the cage capacity. Debu Sentul hens reared in deep litter systems produced fewer eggs than those in colony cages (28.34% vs 36.08%). Kelabu Sentul hens reared in deep litter systems produced fewer eggs than those in colony cages (24.64% vs 41.64%). Kelabu Sentul hens reared in colony cages produced more eggs than Debu Sentul hens (41.64% vs 26.08%). Debu Sentul hens reared in deep litter systems had higher FCR and depletion rates (9.34 and 21.05%, respectively) than those in colony cages (7.04 and 4.76 %, respectively). Kelabu Sentul hens reared in deep litter systems had higher FCR and depletion rates (12.01 and 15.51%, respectively) than those reared in colony cages (6.06 and 10.86 %, respectively). The performance of Kelabu and Debu Sentul hens reared in colony cages was better than in deep litter system cages. The performance of Kelabu Sentul hens reared in colony cages was better than Debu Sentul hens.

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