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Optimisation of KUB-2 Chicken Growth to Increase Feed Efficiency Through Feed Restriction

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ABSTRAK: This study aims to optimise the growth of Superior Balitbangtan (KUB-2) chickens through feed restriction during the starter period and its effect on the recovery phase. This study used 100 two-week-old KUB-2 chickens, placed in 20 cages measuring 70 cm x 70 cm x 60 cm, with each cage containing 5 KUB-2 chickens. The study employed a Completely Randomised Design (CRD) with four treatments and five replicates. The variables observed were feed intake, body weight gain, feed conversion ratio (FCR), Growth Rate, and Income Over Feed Cost (IOFC). The research showed that applying 20%, 30%, and 40% feed restriction had a significant effect (P<0.01) on decreasing feed intake and body weight gain, but had no significant effect (P>0.05) on the feed conversion ratio during the 4-week treatment period. During the recovery phase, ad libitum feeding has a significant impact (P<0.05) on feed intake, but did not affect body weight gain or feed conversion ratio. Throughout the study, feed restriction followed by recovery had a very significant effect (P<0.01) on feed intake and a significant effect (P<0.05) on body weight gain and feed conversion ratio. This study concludes that the 20% feed restriction treatment showed the best performance, with a feed intake of 339.97 g/bird/week, body weight gain of 98.35 g/bird/week, a feed conversion ratio of 3.46, a growth rate of 0.227, and an Income Over Feed Cost (IOFC) of Rp. 14,815.

Keywords: KUB-2 Chickens, feed restriction, recovery, performance, IOFC

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INTRODUCTION

UB-2 Janaka chickens are KUB-breed chickens with improved performance compared to KUB-1 chickens, achieved through genetic selection by researchers at the Ministry of Agriculture. KUB-2 Janaka chickens are KUB-1 chickens selected for their yellow shank trait and production. Male chickens produced from KUB-2 Janaka hatchings are raised as broilers. To measure broiler productivity, body weight gain and feed conversion are essential indicators. This study aims to determine the feed consumption, body weight gain, feed conversion, growth rate, and Income over Feed Cost (IOFC) of KUB-2 Janaka chickens at 12 weeks of age.

Feed is the primary concern in any livestock farming business. Saving on feed costs is a goal that must be achieved to maximise profits from production. According to Suprijatna et al. (2005), feed plays a very strategic role in livestock farming. Feed management is a key factor in determining the success of a farm. One method of feeding used is feed restriction (Darmawati, 2005). Native chickens are less efficient in feed utilisation compared to broiler chickens (Husmaini, 2000). No matter how good the feed given to native chickens, they cannot convert it into meat as efficiently as broiler chickens. Therefore, feed restriction is one way to enhance feed management and achieve compensatory growth (Husmaini, 2000). Additionally, feed restriction can reduce feed conversion and decrease body fat percentage (Kusuma et al., 2016).

Broiler chickens that experience prolonged feed restriction will have difficulty compensating for their growth (Suci et al., 2005). Therefore, restriction will be followed by a recovery period. The feed recovery period for Balitbangtan Superior Native Chickens (KUB-2) is used to allow the livestock to catch up on their growth, a process known as compensatory growth. Compensatory growth is rapid growth that occurs after a growth delay due to constraints, but it can exceed the growth that should have happened at a certain age (Sasongko, 1989). This is because refeeding tends to make livestock aggressive and quick to consume feed. Londok et al. (2012) and Tulung et al. (2015) have conducted research on the effectiveness of feed restriction in poultry, up to 20%, which yields the best feed conversion. Mahmood et al. (2007) stated that feed restriction does not adversely affect the resulting carcass characteristics. Feed restriction is expected to improve carcass quality and quantity. According to Ariesta et al. (2015), the increased productivity and growth of native chickens are facilitated through the preparation of feed compositions, especially those rich in protein. Protein plays a crucial role in the growth of body tissues, especially muscle tissue, which is essential for producing carcass. Husmaini (1994) stated that research on native chickens showed that the carcass percentage in the treatment of 40% feed restriction at two weeks of age for one week was significantly higher than in the treatment of 40% feed restriction at one week of age for one week.

According to Mohebodini et al. (2009), during the recovery period, there was no difference in feed consumption between chickens that had previously received time-restricted feeding and those that were fed ad libitum from 22 to 42 days of age. The success of compensatory growth is indicated by achieving normal body weight at the end of the recovery period. According to Mohebodini et al. (2009), there was no difference in feed conversion at the end of the period between chickens that received time-restricted feeding and chickens that were fed *ad libitum*. Research on feed restriction followed by a recovery period has not yet been conducted on Balitbangtan Superior Native Chickens (KUB-2).

MATERIALS AND METHODS

Research Methods

This study employed an experimental method with a Completely Randomised Design (CRD), comprising four treatments and five replicates. Each replicate comprised five chickens randomly placed in one cage unit. The collected data were statistically analysed using **analysis of variance**, and differences between treatments were further tested using **Duncan's Multiple Range Test (DMRT)**. The treatments in this study were:

A. *Ad libitum* feed provision
B. 20% feed restriction
C. 30% feed restriction
D. 40% feed restriction

Measured Parameters

Feed Consumption To determine the level of feed consumption, feed was weighed weekly. According to Jaelani (2011), the formula used to determine feed consumption is as follows:

Feed Consumption = Given Feed (grams/chicken) – Leftover Feed (grams/chicken)

Body Weight Gain Body weight gain was measured once a week using the formula by Amrullah (2004), as follows:

Body Weight Gain = Final Body Weight (grams/chicken) – Initial Body Weight (grams/chicken)

Feed Conversion Feed conversion was calculated weekly throughout the study (Jaelani, 2011):

Feed Conversion = Body Weight Gain/Feed Consumption

Growth Rate The growth rate (GR) was calculated based on Brody's (1945) formula:

$$GR = (LnW1 - LnW2)/(T1 - T0)$$

Income over Feed Cost (IOFC) Income Over Feed Cost is the comparison between sales and feed costs. The formula for income over feed cost, according to Prawirokusumo (1990), is as follows:

Income Over Feed Cost = (Body Weight Gain × KUB Chicken Selling Price/kg) − (Total Consumption × Feed Price)

Research Feed Ingredients

The feed used was commercial BR1 starter feed, provided *ad libitum* from 1 to 11 days of age. Subsequently, a mixed feed was provided from 11 to 14 days of age for adaptation, with ratios of 75:25, 50:50, and 25:75. Following this, feed restriction was applied from 15 to 42 days of age, with restrictions of 20%, 30%, and 40% of the total feed intake. From 7 to 12 weeks of age, chickens underwent a recovery period treatment. The nutritional content of the research feed ingredients is presented in **Table 1**.

Table 1. Nutritional content of Br1 ration

Nutrient Content	Nutritional Value
Metabolizable Energy	2950 kcal/kg
Crude Protein (%)	21%
Crude Fat (%)	3-7%
Crude Fibre (%)	5%
Calcium (%)	0.9-1.1%
Phosphorus (%)	0.9%
Ash (%)	7%

Source: PT. Japfa Comfeed TBK (2017)

Table 2. Nutrient Content and Metabolizable Energy of Constituent Feed Ingredients for the Research Ration

Feed Ingredient	Nutrient Content (%)						ME (kkal/kg)
	CP	CF	CrF	DM	Ca	P	
Corn[a]	8.5	3.8	2.5	89	0.01	0.28	3300
Rice Bran[b]	6.9	13.0	12	91	0.12	0.21	1630
Concentrate CP 122[c]	33.0	4.0	5	88	3	2.1	2400

Notes:

a. Nuraini *et al.* (2013)

b. Scott *et al.* (1982)

c. Concentrate CP 122 Feed Label PT. Charoen Pokphand Indonesia

Table 3. Research Rationale Composition

Feed Ingredient	Composition (%)
Corn	52.8
Rice Bran	9.8
Concentrate CP 122	37.4
Total	100

Table 4. Nutrient Content and Metabolizable Energy of the Research Ration

Nutrient Component	Feed Ingredient			Total
	Corn	Rice Bran	Concentrate CP 122	
Crude Protein (%)	4.49	0.67	12.34	17.50
Crude Fat (%)	2.01	1.27	4.78	4.78
Crude Fibre (%)	1.32	1.18	1.87	4.36
Ca (%)	0.01	0.01	1.12	1.14
P (%)	0.15	0.02	0.79	0.95
Metabolizable Energy (kcal/kg)	1743.12	159.61	897.27	2800

Notes: Calculated based on Tables 2 and 3

RESULTS AND DISCUSSION

Feed Consumption

The average feed consumption of KUB-2 chickens during the restriction period, recovery period, and over the entire study period is presented in Table 5. The average feed consumption of KUB-2 chickens during feed restriction ranged from 120.45 – 180.01 g/chicken/week. Based on the analysis of variance, feed restriction had a highly significant effect (P<0.01) on the feed consumption of KUB-2 chickens. DMRT results showed that the feed consumption for treatment A (Control), at 180.01 g/chicken/week, was significantly higher (P<0.01) compared to the average feed consumption in treatments B, C, and D.

This was because in treatment A (Control), feed was provided *ad libitum* (unrestricted), leading to higher feed consumption. In contrast, treatments B, C, and D involved feed restriction or a reduction in the amount of feed provided. According to Nova et al. (2019), *ad libitum* feed availability allows livestock to eat at any time according to their needs, thereby increasing consumption. The higher the level of feed restriction applied, the lower the resulting feed consumption. The lowest average feed consumption was observed in treatment D, with a 40% restriction, resulting in an average value of 120.45 g per chicken per week. Chicken growth is faster when they consume more feed. Conversely, if less feed is consumed, their growth is stunted. This finding aligns with those of Nova et al. (2019), who reported that ad libitum (unrestricted) feeding results in higher feed consumption and increased body weight in chickens.

Chicken growth is closely related to the feed they consume. If feed is not restricted, chickens will have more freedom to consume larger amounts of feed. Nuraini and Latif (2012) stated that feed consumption can be influenced by several factors, including age, feed palatability, animal health, animal type, animal activity, feed energy, production level, and feed quantity and quality. Based on the conducted research, it was found that a 20% feed restriction in treatment B was more effective than a 40% feed restriction in treatment D, resulting in lower feed consumption. Therefore, 20% feed restriction is more efficient in converting feed into body weight. This is supported by the research of Londok et al. (2012), which showed that feed restriction up to 20% provided the best feed conversion.

During the recovery period, the average feed consumption of KUB-2 chickens increased sharply. KUB-2 chicken feed consumption during the recovery period ranged from 459.55 – 526.61 g/chicken/week, as shown in Table 5. Based on the analysis of variance, feed provision during the recovery period after restriction had a significant effect (P<0.05) on the feed consumption of KUB-2 chickens. DMRT results indicated that feed consumption in treatment A (Control), at 526.61 g/chicken/week, was significantly higher (P<0.05) than the average for treatments B, C, and D.

Table 5. Average Feed Consumption of Chickens During Restriction, Recovery, and the Entire Study (g/chicken/week)

Treatment	During Feed Restriction (g/chicken/week)	During Recovery Period (g/chicken/week)	Increase in Feed Consumption (%)	During the Entire Study (g/chicken/week)
A	180.01^{A}	526.61^{a}	192.54	387.97^{A}
B	160.61^{B}	459.55^{b}	199.2	339.97^{B}
C	140.53^{C}	481.20^{b}	242.42	344.93^{B}
D	120.45^{D}	483.39^{b}	301.74	338.51^{B}
Average	150.40	487.81	233.98	352.85

Notes:
Superscripts A, B, C, D in the same column indicate a highly significant difference (P<0.01).
Superscripts a,b in the same column indicate a significant difference (P<0.05).

The highest average consumption in treatment A (Control) was 526.61 g/chicken/week, as no restrictions were applied in this treatment, resulting in larger chicken body weights compared to treatments B, C, and D, and thus higher feed consumption. This is consistent with Yulina (2022), who stated that chickens will grow faster if they consume a large amount of feed.

Feed consumption during the recovery period plays a crucial role in achieving compensatory growth. The recovery period is a time for livestock to improve their body condition after experiencing stress due to feed restriction. As shown in Table 5, in treatment D, feed consumption increased significantly by 301.74%, which was higher than in treatments A, B, and C. This increase in consumption occurred because the high level of feed restriction applied in treatment D caused the chickens to consume feed hastily to meet their lagging nutritional needs.

The high feed consumption in treatment A (control) throughout the study was due to the absence of feed restriction, allowing chickens to eat continuously. Feed consumption is influenced by the type of feed, feed size, placement, and method of filling the feed containers. The average feed consumption during the study in KUB-2 chickens ranged from 338.51 – 387.97 g/chicken/week, which is higher compared to Yulina's (2022) research on KUB-1 chickens, which yielded an average of 344.99 – 363.79 g/chicken/week.

Body Weight Gain

The average body weight gain of KUB-2 chickens during feed restriction, the feed recovery period, and over the entire study period is presented in Table 6. The average body weight gain during feed restriction ranged from 37.30 to 65.51 g per chicken per week. Based on the analysis of variance, the restriction treatments had a highly significant effect (P<0.01) on the body weight gain of KUB-2 chickens. DMRT results during the restriction period showed that *ad libitum* feeding resulted in the highest body weight gain of 65.51 g per chicken per week, which was significantly different from all other treatments. The 20% restriction resulted in a body weight gain of 55.27 g/chicken/week, which was considerably lower than that of ad libitum feeding but significantly higher than the 30% and 40% restrictions. The 30% restriction resulted in a body weight gain of 46.79 g/chicken/week, which was significantly higher (P < 0.01) than the 40% restriction but lower than ad libitum feeding and the 20% restriction. Meanwhile, the 40% restriction resulted in the lowest body weight gain, at only 37.30 g per chicken per week.

The highest average body weight gain was observed in treatment A (Control). This occurred because no feed restriction was applied in this treatment, allowing the nutrients in the feed to meet the chickens' nutritional needs during initial growth sufficiently. With *ad libitum* feed provision, chickens could consume as much feed as they wanted, which positively impacted their body weight gain. This finding aligns with Uzer et al. (2013), who stated that the level of feed consumed influences livestock body weight gain; higher feed consumption leads to higher body weight gain, and conversely, lower feed consumption results in lower body weight gain. This is also supported by Nova et al. (2019), whose research showed that high final body weight in chickens was due to *ad libitum* (unrestricted) feeding, leading to higher feed consumption and increased body weight.

Table 6. Average Body Weight Gain of KUB-2 Chickens During Feed Restriction, Recovery Period, and the Entire Study (g/chicken/week)

Treatment	During Feed Restriction (g/chicken/week)	During Recovery Period (g/chicken/week)^{ns}	During the Entire Study (g/chicken/week)
A	65.51^{A}	135.40	107.44^{a}
B	55.27^{B}	124.24	96.65^{b}
C	46.79^{C}	121.31	91.50^{bc}
D	37.30^{D}	119.97	86.90^{c}
Average	51.22	125.23	95.62

The low body weight gain resulting from a 40% restriction was because, although the feed initially provided met the animals' needs, when feed restriction was implemented in the second week, the chickens' body weight gain decreased due to low feed consumption efficiency. This caused stress to the animals, preventing them from achieving their maximum growth potential. Furthermore, feed restriction also reduced the nutrient content in the consumed feed, leading to low body weight gain. One key nutrient for growth is protein content in the feed.

Based on Wulandari's unpublished research (2024), during restriction, the protein intake in treatment D was only 73.76, which was lower than *ad libitum* feeding, 20% restriction, and 30% restriction. This is what caused the low body weight gain in animals subjected to 40% feed restriction. Low body weight gain is attributed to inadequate or limited feed consumption, indicating that the chickens' nutritional needs were not met (Yulma et al., 2014). Additionally, this is supported by Zainudin et al. (2023), who stated that low protein content in feed negatively impacts chicken growth performance.

The average body weight gain during the recovery period, as shown in Table 6, ranged from 119.97 to 135.40 g per chicken per week. Analysis of variance revealed no significant effect (P > 0.05) on body weight gain between KUB-2 chickens fed ad libitum and those subjected to restricted feeding treatments. This indicates that the body weight gain of chickens receiving no restriction treatment was not significantly different from that of those receiving restriction treatment.

During this recovery period, chickens fed *ad libitum* achieved the highest average body weight gain of 135.40 g/chicken/week. This occurred because in treatment A, chickens were not subjected to feed restriction, allowing them to consume feed freely, which correlated positively with increased body weight gain. The most anticipated outcome of this recovery was the occurrence of compensatory growth. Compensatory growth refers to the development that occurs in animals after they experience stress due to limited feed (Sabrina et al., 2014). However, in this study, compensatory growth was not achieved, as evidenced by the fact that the body weight gain of chickens that underwent restriction did not surpass that of chickens fed a standard ration.

This aligns with Soeparno (2005), who stated that animals experiencing food or nutrient deficiencies will exhibit slowed growth. Still, after receiving sufficient food, they can grow rapidly again, even faster than their normal growth rate. This growth is referred to as compensatory growth, meaning "catch-up growth." Compensatory growth can occur ideally, but what is often observed is imperfect compensation, known as stunting or failed compensation.

Besides nutrient deficiency from restriction, the duration of restriction also affects chicken body weight gain. This is supported by Zulfanita (2011), who stated that when restriction was applied at 5 to 8 weeks of age, broiler chickens did not respond well to feed restriction because their opportunity for rapid growth was significantly reduced. Consequently, even with better feed efficiency and lower fat content, their body weight did not reach a standard size.

Feed Conversion

The average feed conversion of KUB-2 chickens during the restriction period, recovery period, and over the entire study is presented in Table 7.

Table 7. Average Feed Conversion of KUB-2 Chickens During Feed Restriction, Recovery Period, and the Entire Study

Treatment	During Feed Restriction^{ns}	During Recovery Periods	During the Entire Study
A	2.76	3.87	3.62^{a}
B	2.74	3.7	3.46^{a}
C	3.01	3.98	3.78^{ab}
D	3.27	4.04	3.90^{b}
Average	2.95	3.9	3.69

Notes: a,b Superscripts in the same column indicate a significant difference (P<0.05). Ns = not substantial.

The average feed conversion during the restriction period ranged from 2.74 to 3.27. Based on the analysis of variance, feed restriction had no significant effect (P>0.05) on the feed conversion of KUB-2 chickens. DMRT results showed that the best feed conversion was found in treatment B (20% restriction) at 2.74, which was lower compared to other treatments. The lower feed conversion in treatment B occurred because less feed was consumed, yet it resulted in good body weight gain. This is also supported by the research conducted by Londok et al. (2012), which indicated that feed restriction up to 20% provided the best feed conversion.

The highest average feed conversion was observed in treatment D, which is likely due to the 40% feed restriction applied in this treatment, resulting in minimal body weight gain. This aligns with Yulma et al. (2014), who stated that low body weight gain is caused by low or limited feed consumption, indicating that the chickens' nutritional needs are not being met sufficiently. High feed conversion values can also occur due to several factors, including reduced feed intake, an imbalance between protein and energy in the feed, and difficulty for the animals in digesting feed ingredients, leading to low palatability.

The average feed conversion during the recovery period ranged from 3.70 to 4.04. This value is lower compared to Yusmanisar's (2019) research, which found a feed conversion of 4.94, and also lower than Yulina's (2022) research, which yielded conversions of 3.70 – 4.12. Based on the analysis of variance, feed provision during the recovery period had no significant effect (P>0.05) on the feed conversion of KUB-2 chickens. The average feed conversion of KUB-2 chickens during the entire study ranged from 3.46 to 3.90. Based on the analysis of variance, feed conversion during the study had a significant effect (P<0.05) on the feed conversion of KUB-2 chickens. DMRT results showed a significant difference (P<0.05) in feed conversion among KUB-2 chickens during the study. Treatment A was significantly different (P<0.05) from treatment D, but not significantly different (P>0.05) from treatments B and C. This is due to the significant difference in the ratio between feed consumed and body weight gain in treatments A and D. Based on the results over the entire study, considering feed conversion, the best result was observed in treatment B (20% restriction), which was approximately 3.46.

Growth Rate

The average growth rates of Balitbangtan Superior Native Chickens (KUB-2) during the feed restriction period and the recovery period are presented in Table 8.

Table 8. Average Growth Rate of KUB-2 Chickens During Restriction, Recovery, and the Entire Study.

Treatment	Growth Rate			
	Restriction Period	Recovery Period	Increase (%)	Entire Study
A	0.255^{A}	0.198^{B}	-0.22	0.243^{a}
B	0.211^{B}	0.194^{B}	-0.08	0.232^{b}
C	0.171^{C}	0.213^{AB}	0.25	0.227^{bc}
D	0.109^{D}	0.229^{A}	1.10	0.221^{c}
Se	0.0092	0.0065		0.0033

Notes:
Superscripts A, B, C, D in the same column indicate a highly significant effect (P<0.01).
Superscripts a, b, c in the same column indicate a significant effect (P<0.05).

The growth rate during the restriction period for Balitbangtan Superior Native Chickens (KUB-2) ranged from 0.11 to 0.25 (from treatment A to E). Analysis of Variance showed that the feed restriction treatment for KUB-2 chickens had a highly significant effect (P<0.05) on growth rate.

Duncan's Multiple Range Test (DMRT) results indicated that treatment A was significantly higher (P < 0.01) than treatments B, C, and D. The higher growth rate in treatment A was attributed to the absence of feed restriction. In contrast, treatments C and D had lower growth rates due to 30% and 40% feed restriction, respectively. This caused stress to the KUB-2 chickens, leading to lower growth and feed consumption compared to the control ration.

This aligns with Dewanti et al. (2009), who stated that as a non-genetic factor, the ration can influence body weight and growth rate, which are closely related to feed consumption. According to Tillman et al. (1998), the growth rate of livestock is partly determined by the amount of feed consumed. If the amount of feed consumed is relatively high, growth is rapid; however, if the amount of feed consumed is relatively small, growth is inhibited.

During the recovery period, the growth rate of KUB-2 chickens ranged from 0.19 to 0.23 (from treatment A to E). Analysis of Variance (ANOVA) (9) showed a highly significant effect ($P < 0.01$) on protein intake. Duncan's Multiple Range Test (DMRT) results indicated that treatment D was not significantly different from treatment C, but was highly significantly different from treatments A and B. This is because the feed restriction treatment and *ad libitum* refeeding in treatments B, C, and D were able to catch up with the growth rate of treatment A, which was fed *ad libitum*.

Hanifah (2019) stated that there is an indication of compensatory growth during the recovery period, where animals can catch up after their feed has been restricted. The eating behaviour of chickens after restriction becomes hasty because they are trying to meet their life needs and nutritional requirements. This is consistent with Rizal's (2000) statement that animals consume feed to meet their energy needs for maintenance, growth, production, and reproduction.

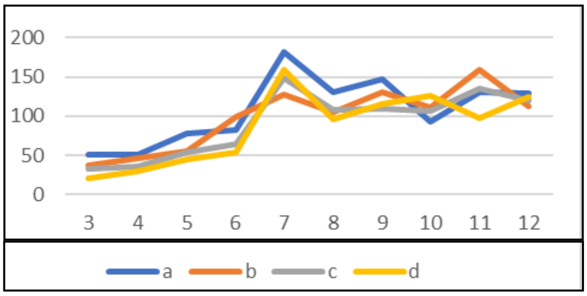

Figure 1. Graph of Average Growth Rate During the Study

The percentage increase in growth rate during the restriction and recovery periods, with the highest percentage value found in treatment D at 110% and the lowest in treatment A at -22%, indicates that the greater the restriction stress given to KUB-2 chickens, the higher the percentage increase in growth rate relative to the baseline growth rate. Treatment D was able to achieve compensatory growth rapidly through feed consumption after 40% restriction. This is a state in the animal's body called compensatory growth, which is the ability of animals to grow faster than usual after experiencing growth inhibition due to limited feed.

In treatment A, the percentage increase was reduced or slow because the chickens were accustomed to being fed under normal conditions, and thus no change in eating behavior was observed. No restriction was applied, and consequently, compensatory growth did not occur in the animals' bodies. This also aligns with David and Subalini (2015), who stated that compensatory growth is influenced by feed restriction.

During the entire study, the growth rate of Balitbangtan Superior Native Chickens (KUB-2) ranged from 0.22 to 0.24 (from treatment A to D). Analysis of Variance showed a highly significant effect ($P < 0.01$) on growth rate. Duncan's Multiple Range Test (DMRT) at 5% indicated that treatment A was significantly different ($P<0.05$) from treatments B, C, and D. Treatment B was not significantly different from treatment C but substantially different from treatment D. Treatment C was not significantly different from treatment D.

This is because the feed restriction treatment and refeeding with *ad libitum* feed provision in treatments B, C, and D were able to catch up with the growth rate of treatment A, which was given commercial feed *ad libitum*. Husmaini (2000) stated that *ad libitum* feed provision after feed restriction in native chickens has been proven to cause compensatory growth with better feed efficiency, allowing the chickens to catch up on their lagging growth and absorb more food.

Income Over Feed Cost (IOFC)

The average **Income Over Feed Cost (IOFC)** for KUB-2 chickens during the study is presented in Table 4.

Table 4. Average Income Over Feed Cost (IOFC) of KUB-2 Chickens During the Study

Description	Treatment A	Treatment B	Treatment C	Treatment D
I. Revenue				
1. Live Weight (Kg)	1.17	1.06	1.01	0.96
2. Selling Price (Rp/Kg)	40000	40000	40000	40000
A1. Total	46800	42400	40400	38400
II. Expenditure				
1. Consumption (Kg)	3.88	3.40	3.45	3.39
2. Feed Cost (Rp/Kg)	8114	8114	8114	8114
A2. Total	31479	27585	27987	27467
IOFC (A1-A2)	15321	14815	12413	10933

Based on the research findings, the highest IOFC for KUB-2 chickens was found in Treatment A, at Rp. 15,321, while the lowest IOFC was in Treatment D, at Rp. 10,933. The higher IOFC in Treatment A (Control) is attributed to the higher body weight gain in this group, which received no feed restriction. Conversely, in chickens subjected to up to 40% restriction, the resulting body weight was lower, leading to a decrease in the income-to-feed-cost ratio.

The IOFC value is derived from the ratio of revenue from selling KUB chickens to total feed costs incurred. The magnitude of the IOFC value varied significantly among treatments, as all treatments yielded a profit, with the highest profit achieved in Treatment A. According to Rasyaf (2007), a higher Income Over Feed Cost (IOFC) indicates a higher revenue obtained from the sale of chickens.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the findings of this study, it can be concluded that feed restriction at 20%, 30%, and 40% significantly reduced ($P < 0.01$) feed consumption and body weight gain, but had no significant effect ($P > 0.05$) on feed conversion during the 4-week treatment period. During the recovery period, *ad libitum* feed provision significantly affected ($P<0.05$) feed consumption, but had no significant effect on body weight gain or feed conversion. Throughout the entire study, feed restriction followed by recovery had a highly significant effect ($P < 0.01$) on feed consumption and a considerable impact ($P < 0.05$) on growth rate and feed conversion. This research concludes that treatment B (20% restriction) showed the best performance, with a feed consumption of 339.97 g/chicken/week, body weight gain of 98.35 g/chicken/week, feed conversion of 3.46, and an Income Over Feed Cost (IOFC) of Rp. 14,815.

Recommendations

Based on these research results, it is recommended to apply a **20% feed restriction** as it can reduce feed conversion and save on feed costs.

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