Journal of Animal Science and Veterinary Medicine
Volume 8(4), pages 153-158, August 2023
Article Number: 2DB202949
ISSN: 2536-7099
https://doi.org/10.31248/JASVM2023.373
https://integrityresjournals.org/journal/JASVM

Full Length Research

Influence of modified feed troughs on performance and feed cost of finisher broilers

Usoro, O. O.*, Christopher, G. I., Ndak, U. U., Williams, M. and Utin, E.

Department of Animal Science, Faculty of Agriculture, Akwa Ibom State University, Nigeria.

*Corresponding author. Email: appearance.concepts@yahoo.com.au

Received 4th April 2023; Accepted 19th July 2023

ABSTRACT*:* An experiment was conducted to study the influence of modified feed troughs on the performance and cost of production of finisher broilers. A total of ninety (90) 4 weeks old birds were used for the experiment. They were divided into three treatments of thirty (30) birds each and replicated three times with ten (10) birds each, using a completely Randomized Design (CRD). The treatment groups were assigned with different feed troughs such that treatment 1 had the Conventional Feed Trough (CFT), treatment 2 had Beveled Edge Feed trough (BEF) and treatment 3 had the Partitioned Feed Trough (PFT). The birds were fed isonitrogenous and isocaloric commercial diet. Feed and water were provided *ad libitum*. Data were collected on initial body weight, final body weight, body weight gain, feed intake, feed conversion ratio. Carcass characteristics and economics of production were further used to calculate the performance of finisher broilers under the three treatments. The data obtained were subjected to analysis variance and significant means were separated using Duncan multiple range test. Birds fed with the (BEF) showed highest significant ($p<0.05$) final body weight of 2853.33 g, total body weight gain of 1814.4 g per bird, total feed intake of 3122.96 g and best feed conversion ratio of 1.75 compared with birds under CFT and PFT. The results obtained for carcass analysis indicated that birds under BEF and PFT had significantly ($p<0.05$) higher weights of breast, wing, back, shank, heart and gizzard than CFT. The BEF gave the lowest unit cost of production of the finisher broiler (N1185.60) against the N1329.84 and N1324.47 for CFT and PFT respectively. The BEF is therefore adjudged best and recommended in controlling feed wastage and improving the performance of finisher broilers.

Keywords: Cost, finisher broilers, Influence, modified feed troughs, performance.

INTRODUCTION

Broiler production is a lucrative enterprise because it adapts to most climates, has fast growth rate and production cycle, generates income and creates employment opportunities (Sam *et al*. 2019, Williams *et al*., 2017, Alphonsus *et al*., 2012). Feed is the most significant input in broiler production and has an over-riding effect on the financial viability on the production cycle as it constitutes 70% of the total cost of production (Usoro and Christopher, 2022; Sam *et al*., 2010; Isaac *et al.,* 2011). Feed intake and its efficient utilization constitutes concern in poultry production as feed cost and wastage increase cost of production (Essien and Sam, 2018). Wastage reduces feeding efficiency of birds as well as production performance. Several studies have been conducted in efforts to reduce feed wastage in broiler production. Reduction of feed wastage and substantial improvement in feed conversion ratio using pelleted feed was reported by Simon Kern (2015), Gadzirayi *et al*. (2006) and Arcuri (2017). At the rearing environment, Leone (2010) reported the use of properly designed, arranged and managed feed trough to prevent feed wastage. In an earlier study, Buskirk *et al*. (2003) and Wolter *et al*. (2009) suggested that design features like size, location, geometry, spacing and angle of feeders can affect feeding behaviour of animals. Although the conventional feeders are designed for easy access of feed by birds, the Owners Builders Network (2016) recommended they should be modified. In an earlier study by Neves *et al*. (2014), it was reported that partitioning girds over feed trays in poultry industries promotes a better distribution of the birds around the feeding troughs, reduces competition for feed and feed wastage. The Neves *et al.* (2010) also reported that broilers tend to spend more time at the feeders with a partition gird, and this can be explained by the ease of access to the feeding area although it cannot be claimed that the birds had a higher intake. Recently, Farmers Joint (2018) highlighted the description of feeding troughs needed to prevent feed wastage in poultry as follows: Feeders should have a dip lip instead of straight edge, secondly, feeder should not be more than one third to half full, and finally, feeder depth should be at least 7cm deep and hung at the same level to the bird's neck. In an earlier study, Nesheim *et al*. (1979) recommended that the girding principle in feeder design must be easy to fill and clean, built to avoid wastage, arranged such that fowls cannot roost on them; and constructed with durable materials. Reports above indicates that designs may have impacts on feeding behaviour and production performance. This study therefore aimed at studying the influence of modified feed troughs on the performance and cost effectiveness of production of finishing broilers.

MATERIALS AND METHODS

Experimental site

This study was carried out at the Poultry Unit of Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Akwa Ibom State University, Obio Akpa. Obio Akpa is located between latitudes 4°30'N and 5º00'N and longitudes 70°30'E and 80°00'E. The area is characterized with an annual rainfall ranging from 3500 – 5000 mm and average monthly temperature of 27.5 ± 1.5°C, and relative humidity between 60 – 90%. It is in the tropical rainforest zone of Nigeria. The people in the study areas depend on livestock and crop production (AKSG Online, 2023).

The designs of the feed troughs

The different designs of feed troughs that were used in the experiment were fabricated in Obio Akpa, Oruk Anam Local Government Areas, Akwa Ibom State. They were as follows:

Conventional Feed Trough (CFT) – Treatment 1

The conventional feed trough is a common design of the poultry feed trough used in most farms. It has a conical top with a base. The conical top has a cavity which accommodates the feed and is released gradually as the birds exhaust the ones earlier released. The peculiar feature of most of the conventional feed trough is that the basal area section from where the birds pick up the feed is not provided with a lip, as such when feed released from the conical top fills the base, they easily fall off as the birds make attempt to eat from the basal container. This is a major weakness of the conventional feed trough. Plate 1 shows a picture of the Conventional Feed Trough.

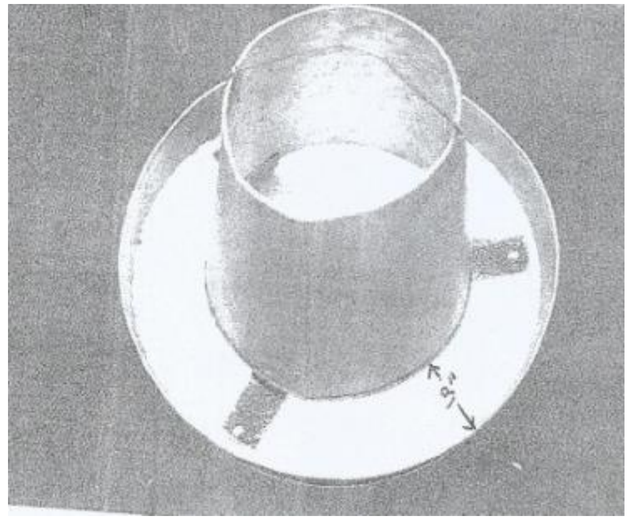

Plate 1. Picture of the conventional feed trough (CFT).

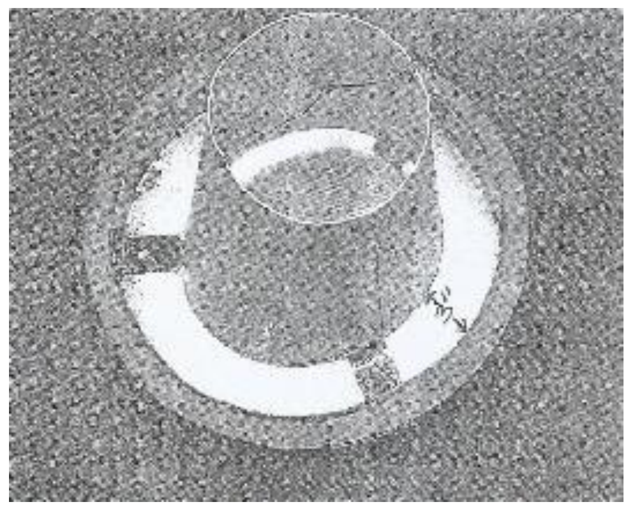

Plate 2. Picture of the beveled edge feed trough (BEF).

Beveled Edge Feed Trough (BEF) - Treatment 2

The Beveled Edge Feed Trough (BEF) was designed to offset the weakness of the conventional feeder. This has the conical top, which houses the feed and releases it as the birds eat from the basal container. The peculiar feature of the BEF is that the bent circular or inclined edge is provided with a circular guard or lip which prevents feeds from falling off while the birds are feeding. This is a modification to prevent the wastage of feeds. Plate 2 shows a picture of the Beveled Edge Feed Trough.

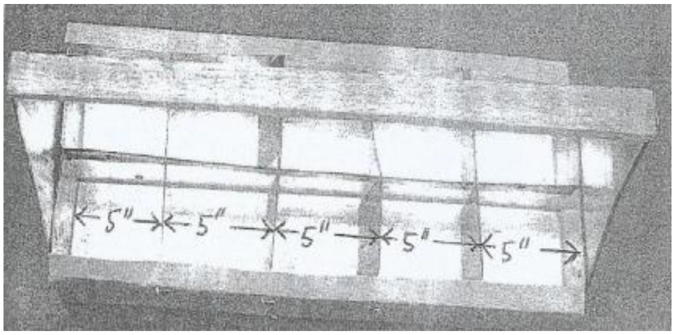

Plate 3. Picture of the partitioned feed trough (PFT).

The Partitioned Feed Trough (PFT) – Treatment 3

The Partitioned Feed Trough is a rectangular tray, partitioned into two compartments. The PFT was modified by providing a lip so that feeds cannot fall off when the birds are feeding. Plate 3 shows a picture of the Partitioned Feed Trough.

Experimental birds

A total of ninety (90) birds at their 28-days of age were used for the experiment. They were divided into three treatments of thirty (30) birds each and replicated three times with ten (10 birds each using a completely randomized design (CRD). They were assigned the different feed troughs such that treatment 1 which also served as the control had the Conventional Feed Trough (CFT), treatment 2 had Beveled Edge Feed trough (BEF) and treatment 3 had the Partitioned Feed Trough (PFT). The birds were fed isonitrogenous and isocaloric commercial diet. Feed and water were provided *ad libituim*. Prophylactic treatment and necessary medications were administered accordingly. The experiment lasted for 3 weeks (21 days).

Data collection

The birds were weighed at the beginning of the experiment and weekly thereafter. Data were collected on initial body weight, final body weight, body weight gain feed intake, feed conversion ratio, feed wastage and mortality. Average body weight gain (g/bird) was calculated by difference between final body weight and initial body weight. Feed intake (g/bird) was determined by subtracting the amount of left over feed from the amount served. Feed conversion was determined by diving feed intake by body weight gain.

Economics of production

The economics of production was achieved by determining the net profit from the sale of broiler birds. The net profit was determined by summing up total variable cost (cost of birds, cost of feed, cost of medication) and subtracting same from the total revenue accrued from the sale of birds.

Carcass evaluation

One (1) bird was randomly selected from each replicate. A total of three (3) birds were selected from each treatment. They were starved overnight; live weights were taken before they were sacrificed by cervical bone dislocation. Thereafter, their jugular veins were severed and the carcasses thoroughly bled. The carcasses were scalded in hot water for about a minute and the feathers plucked manually. The carcasses were eviscerated by cutting through the vent. Dressed weights were taken as well as weights of thigh, drumstick, breast, wing, back, neck, shank, head, heart, gizzard and liver. The dressed carcasses weights were expressed as percentage of live weight.

Data analysis

The data obtained were subjected to analysis of variance (ANOVA) and significant means were separated using the Duncan multiple range test.

RESULTS AND DISCUSSION

The productive performance, carcass characteristics and economics of production of finishing broilers are presented in Tables 1, 2 and 3. There was a significant ($p<0.05$) difference in final body (2723.33, 2853.33 and 2690.00 g for CFT, BEF and PTF respectively) weights of birds. The final body weight of birds fed with BEF was higher than birds fed with CFT and PFT. There was also a significant ($p<0.05$) difference in body weight gain of birds. Birds fed with the BEF had higher gain than CFT and PFT. The gains in CFT and PFT were comparable. The gain in BEF fed birds was as a result of improved average final body weight. Average feed intake of birds fed with BEF was also significantly ($p<0.05$) different. Feed conversion ratio was best in birds fed with the BEF. It is possible that the beveled edge of the BEF prevented feed spillage and wastage by preventing excess of extra feed on the beak of the birds into the feed trough. It assumed that the BEF allowed the bird to ingest almost all that was picked at each bite and utilize properly, hence, the weight gain. It was suggested that the beveled edge of the BEF acted as a feed management strategy and allowed most of the extra feed on the beak to fall back into the trough instead of spilling and wasting. This result agrees with the findings of Farmer Joint (2018) that using feeders with lip, instead of those with straight edges prevent feed wastage. The higher feed intake may have been as a result of the

Table 1. Productive performance of finisher birds fed with modified feed troughs.

Parameter	CFT	BEF	PFT	SEM
Average initial weight (g)	1037.33^{a}	1039.00^{a}	1035.00^{a}	4.15
Average final body weight (g)	2723.33^{b}	2853.33^{a}	2690.00^{c}	32.58
Average body weight gain (g)	1686.09^{b}	1814.4^{a}	1655.01^{b}	33.39
Average feed Intake (g)	3109.23^{a}	3122.96^{a}	3045.63^{b}	14.99
Average feed wasted (g)	777.31^{a}	780.74^{a}	761.41^{b}	3.75
Feed conversion ratio	1.89^{a}	1.75^{b}	1.88a	0.03
Mortality	0	0	0	

CFT – Conventional feeding trough, BEF – Beveled edge feeding trough; PFT – Partitioned feeding trough.

Table 2. Carcass characteristics of finisher broilers fed with modified feed troughs

Carcass parameter	CFT	BEF	PFT	SEM (±)
Live weight (g)	3066.67^{a}	3033.33^{a}	3066.67^{a}	58.00
Dressed weight (g)	2266.67^{b}	2400.00^{a}	2433.33^{c}	40.82
Dressing percentage	74.10^{b}	79.14^{a}	79.37^{b}	1.17
Carcass characteristics (% of live weight)				
Thigh	12.89^{a}	12.00^{a}	11.14^{b}	0.64
Drumstick	11.26^{a}	10.00^{a}	11.30^{b}	0.34
Breast	20.91^{a}	22.28^{a}	22.40^{b}	0.96
Wing	7.08^{a}	7.86^{a}	6.91^{b}	0.17
Back	5.78^{a}	6.65^{a}	7.51^{b}	0.42
Neck	3.35^{a}	2.55^{a}	3.34^{b}	0.15
Shank	3.25^{a}	3.44^{a}	3.59^{b}	0.08
Head	2.04^{a}	2.04^{a}	2.13^{b}	0.05
Organ weight (% of live weight)				
Heart	0.39^{a}	0.46^{a}	0.45^{b}	0.02
Gizzard	1.84^{a}	6.65^{a}	7.51^{b}	0.42
Liver	1.90^{a}	1.86^{a}	1.87^{b}	0.06

a, b, c – Means with same alphabets are not significantly different from each other, CFT – Conventional feeding trough, BEF – Beveled edge feeding trough, PFT – Partitioned feeding trough.

Table 3. Economics of production of finisher broilers fed with modified feed trough.

Item	CFT	BEF	PFT
Cost of 4-week oil bird (₦)	675.22	660.56	654.14
Total cost of feed intake (N) per bird	569.49	571.83	558.68
Cost of medication (N) per bird	50.00	50.00	50.00
Cost of production (N) per bird	1294.72	1282.38	1262.82
Selling price (N) per bird	1483.21	1550.24	1433.21
Profit (N) per bird	188.50	267.86	170.39

availability of the feed for consumption in the trough caused by the beveled edge of the BEF and this represented nutrient utilization by birds as opposed to lower feed intake observed by birds in treatments 1 (CFT) and 3 (PFT). The lower feed intake recorded by treatments 1 and 3 may have been that feed was spilled into the litter and the birds could not access sufficient feed to convert to body gain. This result agrees with Scott (2005) who reported increased intake with the use of modified feeding trough. Feed conversion ratio of birds fed with BFT was better compared to birds fed with CFT and PFT. The results of feed conversion ratio imply that birds fed with the BEF were able to convert the quantity of feed they had to a higher body weight gain. Attaining a high feed conversion is the major objective of poultry feeding. This agrees with Chehraghi *et al*. (2013) who stated that good feed conversion is very key in profitability in poultry business.

The dressed weights and dressing percentage of birds showed a significant ($p<0.05$) difference. Dressed weights of birds fed with BEF and PFT were significantly higher than those of birds fed with CFT. Thigh and drumstick weight of birds using BEF and PFT were significantly different with birds fed with the CFT having the highest value. Breast weights also showed a significant ($p<0.05$) difference with birds fed with CFT having the lowest value. Heart and gizzard also showed a significant ($p<0.05$) difference with higher weights in BET and PFT. Although there was an inconsistent trend in carcass characteristics, on the whole, birds fed with the BET had better carcass yield than birds fed with CFT. This could be attributed to the high feed intake, body weight gain and feed conversion ratio of birds fed with BET over the CFT and PFT in the experiment.

The cost of production of birds were numerically higher in birds fed with the CFT and lower in birds fed with BET and PFT. Selling price was higher in birds fed with BET compared to CFT and PFT. The highest profit was obtained from broiler birds that were fed using the BET followed by CFT and PFT. The profit margin was directly affected by the feed intake. Profit obtained was seen to be a factor of feed intake. The higher feed intake and the best feed conversion ratio in birds fed with BET is a clear indication of low feed wastage and this reduced the production cost of broilers fed with BET. This result agrees with Simon Kern (2015) who reported reduced economics of production of birds with higher feed intake and efficient feed conversion when birds were fed pelleted diet.

Conclusion

The design of the Beveled Feed Trough (BEF) enhanced ease of access by the birds compared to the Conventional Feed Trough (CFT) and the Partitioned Feed Trough (PFT). Thus, broiler birds that fed from the Beveled Edge Feeder (BEF) showed superior performance in body weight gain, carcass evaluation and increased net income relative to Conventional Feed Trough and Partitioned Feed Trough, as such, the BEF is adjudged fit to prevent feed wastage and improve performance of finisher broilers.

Recommendation

Based on the findings of this study, it is recommended that broiler farmers should use the beveled edge feed trough in feeding their birds to prevent feed wastage and improve performance. Further study is advocated to test the influence of modified feed troughs on starter broilers, being that wastage is much in broiler starter phase than in finisher phase. Also, other forms of modifications of poultry feeders should be considered.

CONFLICT OF INTEREST

The authors declare that they have no conflict interests.

REFERENCES

AKSG Online (2023). *Akwa Ibom State: Geography and Location.* Retrieved May 23rd 2023 from https://www.aksg online.com/about_geography.html

Alphonsus, C., Sam, I. M., Opoola, E., & Ayigun, A. E. (2012). Correlated relationship amongst performance and carcass characteristics in broiler chickens raised to maturity. *Animal Production Research Advances*, *8*(1), 50-53.

Arcuri, L. (2017). Types of commercial chicken or poultry feed – How to choose feed for your chickens. Retrieved from https://www.thespruce.com/types-commercial-chicken-or-poultry-feed-3016568

Buskirk, D. D., Zanella, A. J., Harrigan, T. M., Van Lente, J. L., Gnagey, L. M., & Kaercher, M. J. (2003). Large round bale feeder design affects hay utilization and beef cow behavior. *Journal of Animal Science*, *81*(1), 109-115.

Chehraghi, M., Zakeri, A., & Taghinejad-Roudbaneh, M. (2013). Effects of different feed forms on performance in broiler chickens. *European Journal of Experimental Biology*, *3*(4), 66-70.

Essien, C. A., & Sam, I. M. (2018). Effect of Anthonotha macrophylla (African beans) leaf meal on the blood profiles of finishing broiler chickens. *International Journal of Agriculture: Research and Review*, *6*(1), 43-48.

Farmers Joint (2018). Avoiding feed wastage in poultry. Retrieved from http://farmersjoint.com/

Gadzirayi, C. T., Mutandwa, E., Chihiya, J., & Mlambo, R. (2006). A comparative economic analysis of mash and pelleted feed in broiler production under deep litter housing system. *International Journal of Poultry Science*, *7*, 629-631.

Isaac, L. J., Udo, U. H., Usoro, O. O., Ekanem, E., & Williams, M. E. (2011). Relationship between body weight and linear body measurements in different breeds of rabbits. In: *Proceedings of the 36th Annual Conference of Nigerian Society of Animal Production*.

Leone, E. H., Christman, M. C., Douglass, L., & Estevez, I. (2010). Separating the impact of group size, density, and enclosure size on broiler movement and space use at a decreasing perimeter to area ratio. *Behavioural Processes*, *83*(1), 16-22.

Nesheim, N. C., Austic, R. E., & Card, L. e. (1979). *Poultry Production* (12th Edition). Coll. Mag. Press Co. Hutchinson, London.

Neves, D. P., Banhazi, T. M., & Nääs, I. A. (2014). Feeding behaviour of broiler chickens: a review on the biomechanical characteristics. *Brazilian Journal of Poultry Science*, *16*, 01-16.

Neves, D. P., Nääs, I. A., Vercellino, R. D. A., & de Moura, D. J. (2010). Do broilers prefer to eat from a certain type of feeder? *Brazilian Journal of Poultry Science*, *12*(3), 179-187.

Owners Builders Network (2016). 6 Clever solutions to reduce chicken feed waste. Retrieved from https://theownerbuildernet work.co/easy-diy-projects/diy-projects-for-pets/clever-solutions-reduce-chicken-feed-waste.

Sam, I. M., Akpa, G. N., Alphonsus, C. G., Iyeghe-Erakpotobor, I., & Agubosi, O. C. P. (2010). Effect of sex separation on growth performance and carcass characteristics of broilers raised to maturity. *Continental Journal of Animal and Veterinary Research*, *2*(1), 35-40.

Sam, I. M., Essien, C. A., Ukpanah, U. A., & Ekpo, J. S. (2019). Influence of sex on relationship between morphometric trait measurement and carcass traits in broiler chicken raised in humid tropic. *Journal of Animal and Veterinary Advances*, *18*(11), 309-314.

Scott, T. A. (2005). Variation in feed intake of broiler chickens. *Recent Advances in Animal Nutrition in Australia*, *15*, 237-244.

Simon Kern, M. S. (2015). Advantages of Pelleted Swine Grow-Finish Feed. Form A Feed. Retrieved from https://formafeed.com/advantages-pelleted-swine-grow-finish-feed/#:~:text=The%20overall%20flowability%20of%20properly,mortality%20due%20to%20digestive%20upsets.

Usoro, O. O., & Christopher, G. I. (2022). Efficacy of grit and Enzyme supplementation in Brewers' Spent Grains-Based diets for Broilers. *International Journal of Agriculture and Rural Development*, 25(1), 6216-6224

Williams, M. E., Igile, G. O., Usoro, O. O., & Offiong, E. (2017). Assessment of heavy metals in body muscles/organs of locally reared poultry in cocoa and non-cocoa producing areas of Cross River State, Nigeria. *J Anim Sci Vet Med*, *2*(3), 72-78.

Wolter, B. F., Ellis, M., Curtis, S. E., Parr, E. N., & Webel, D. M. (2000). Group size and floor-space allowance can affect weanling-pig performance. *Journal of Animal Science*, *78*(8), 2062-2067.