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The Biologic and Economic Effect of Introducing Poultry Waste in Rabbit Diets

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Abstract: A 12 week feeding trial was conducted using 24 (2-3 months-old) Chinchilla rabbits to assess the economic effect of substituting poultry litter (PL) for soy bean meal (SBM). Soy bean meal in the diets was replaced with poultry litter at 0% (Diet A-control), 5% (Diet B), 10% (Diet C) and 15% (Diet D). The rabbits were divided into four groups; each group was assigned to one of the four dietary treatments in a Completely Randomized Block Design (CRBD). Each treatment was replicated three times. The economics of production indicated a better performance in poultry litter substituted diets over the control group in all the indices vis-à-vis cost/kg feed (₦), cost/kg weight gain, cost of weight gain (₦) and relative cost (%) measured suggesting that poultry litter has an economic advantage over soy bean meal as protein supplement in ration formulation.

Key words: Chinchilla rabbits, economics of production, poultry litter, soy bean

INTRODUCTION
The recent high cost of feed ingredients in particular have brought about the need to look inwards for alternative to the conventional feed resources. It is therefore imperative to explore other feed materials that are not useful to human (Aletor, 1986; Aletor and Ogunyemi, 1990; Mustapha and Tunde, 1990; Alawa and Umunna, 1993; Owen et al., 2008). The limited supply of raw materials for the feed industry has resulted in a continuous increase in the cost of production, causing a phenomenal rise in the unit cost of products. The increase in the cost of grains in Nigeria has been related to its scarcity as a result of competing for these feed ingredients. To depend on alternative sources of ingredients, especially when it encouraged a shift to ingredients for which there is less competition, may help if the later is sufficiently available (Oluyemi and Robert, 1979).

A wide array of industrial by-products and agricultural wastes exist, among which is poultry litter. Studies in the utilization of agro-industrial by-products in animal feed has increased in the past two decades because of the clear necessity to conserve these ingredients for human feeding especially in the less developed countries. There is also increasing knowledge of the problems created in the environment by disposing these industrial by-products and agricultural wastes. The rational use of these nutritive diets for animal production can reduce the high price of feedstuffs.

There is also an increasing knowledge of the composition and potential nutritive values of a majority of industrial by-products and agricultural wastes.

Furthermore, there is also a need to shift emphasis from other conventional animal species to rabbits in order to explore their relative position in the overall animals industry. Agro-industrial by-products contain some fibre. Rabbit is known for its ability to digest fibre efficiently (Aduku and Olukosi, 1990; Fielding, 1991; Berepubo et al., 1995; Alawa and Oyarole, 2004).

A statement on food consumed and product obtained should provide basic data in evaluating rations for farm animals (Maynard et al., 1979; Ukachukwu and Anugwa, 1995). Feed conversion ratio (FCR) is an important performance index in animal production. It is the expression of the quantity of feed consumed to obtain a unit of the products. Feeds and feeding constitute about 70-80% production cost in poultry. The cost of food consumed to obtain a unit of products should therefore form a basis for recommending feeds to farmers (Ukachukwu and Anugwa, 1995). In the present study, the economics of substituting poultry litter (PL) for soy bean meal (SBM) in rabbit diets was investigated.

MATERIALS AND METHODS
Twenty-four (2-3 months-old) Chinchilla rabbits were used in an experiment that lasted 84 days. They were selected and randomly allocated to 4 treatment diets at 6 weaner rabbits per treatment in a Completely Randomized Block Design (CRBD) trial. Each treatment was replicated into three at 2 rabbits per replicate. The dietary treatments are as follows:
(I) 0% poultry litter (Diet A-Control)
(II) 5% poultry litter (Diet B), 10% poultry litter (Diet C) and 15% poultry litter (Diet D).

Table 1: Effects of supplementing Soya bean meal with graded levels of poultry litter on economics of production

Parameters	A (0% PL)	B (5% PL)	C (10% PL)	D (15% PL)
Weight gain (kg)	0.94±0.06[a]	0.94±0.04[a]	0.87±0.09[b]	0.87±0.05[b]
Total feed intake (kg)	5.41±0.18[b]	5.58±0.41[b]	5.60±0.20[b]	5.69±0.16[a]
Feed efficiency (Feed/Gain ratio)	5.75±0.12[a]	5.95±0.19[a]	6.43±0.5[b]	6.57±0.09[b]
Cost/kg feed (₦)	47.62	43.62	39.62	35.62
Relative cost (%)	100	91.60	83.20	74.80
Cost/kg weight gain (₦)	273.82	259.54	254.76	234.02
Cost of weight gain (₦)	257.40	243.96	221.64	203.59
Revenue from weight gain (₦)	752.00	752.00	696.00	699.00
Gross margin (₦)	494.80	508.04	474.36	492.41

Feed and water were supplied *ad libitum* in the hutches made of bamboo with wire mesh. Feed consumption was recorded daily while rabbits were weighed weekly. Data obtained were subjected to analysis of variance (Steel and Torrie, 1990) and Duncan's multiple range test was applied to partition means, where necessary (Duncan, 1955). The cost per unit weight gained as a result of using any of the diets was obtained using: cost/kg weight gain (N) = unit (kg) cost of feed multiplied by weight of feed required for 1kg body weight gain (i.e. FCR). Since every factor or cost input involved in the management of the four treatment groups was constant except cost of feed, gross margin was determined based on cost of feed only.

RESULTS AND DISCUSSION
Table 1 shows the effects of different levels of poultry litter inclusion on the economic performance of rabbits. Table 1 shows the effects of supplementing soya bean meal with graded levels of poultry litter on the economics of production.

The cost (N) per kg feed for treatments A (control), B, C and D were 47.67, 43.62, 39.62 and 35.62, respectively. It was found that the diet containing 15% poultry litter (treatment D) had the lowest cost per kg feed while treatment A (control) with 0% poultry litter had the highest cost per kg feed. On relative cost basis, the cost per unit (kg) of treatment B (containing 5% poultry litter) was 91.60% of cost per unit (kg) of control diet. Treatment C (containing 10% poultry litter) and treatment D (containing 15% poultry litter) were 83.20% and 74.80% respectively of cost of control diet. The rabbits on the control treatment had the highest cost per kg weight gain (₦273.82) and the treated groups had ₦234.02, ₦254.76 and ₦259.54 for treatments D, C and B, respectively. The cost/kg weight gain were ₦273.82, N259.54, N254.76 and ₦234.02 for treatments A, B, C and D, respectively. Weight gain is an important factor to consider; however feed cost per kilogram of gain is also an important production index. Using the figures of ₦273.82 and ₦259.54 per kg of gain for the control (0% PL) and 5% PL supplemented diet, respectively, one can see a tremendous opportunity to reduce input cost while maintaining similar weight gains. These two feeding regimens yielded the same weight gains, but the 5% PL treatment reduced feed cost per kilogram by ₦14.28 or 5.22%.

While the remaining PL diets resulted in significantly (P < 0.05) lower weight gains than that of the control diet, the reduced feed cost still allowed for a potential profit. The 15% PL diet which yielded the same weight gain with the 10% PL diet produced the highest benefit of ₦39.80 or 14.53% per kg. The feed treatment of 10% poultry litter produced feed cost reduction of ₦19.06 per kilogram of gain, or 6.96%.

The result obtained from this study showed that the use of poultry litter as a feed substitute reduced costs. This is in agreement with the findings of Smith and Wheeler (1979) and Senez *et al.* (1980), who used poultry litter in the nutrition of West Africa Dwarf (WAD) goats and reported a better economic performance in goats fed poultry litter. However, Maynard *et al.* (1979) stressed that an essential practical consideration in evaluating a ration for farm animals is its cost in terms of returns obtained for the products.

The inclusion of 15% poultry litter would cost ₦35.62 per kg. It would save the cost of concentrate in the feed mixture. The difference will be about ₦12.00/kg and ₦12,000.00/ton of feed. In other words, poultry litter mixed concentrate feed will cost less than the cost of a ton of concentrate feed presently available in the market. The inclusion of poultry litter in the diets generally improved the economics of production such as cost/kg feed and cost/kg weight gain

Conclusion: The cost return pattern is a reflection of the biological effect as expressed in the results obtained. Treatment A (containing 5% PL) which encouraged the same weight gain, feed conversion ratio and feed intake gave the best revenue from weight gain that is comparable to the control diet. The same diet eventually resulted to the highest gross margin from the sales of the rabbits.

REFERENCES
Aduku, A.O. and J.O. Olukosi, 1990. *Rabbit management in the tropics*. Living Books Series. Gu publications, Abuja, Nigeria.

Alawa, J.P. and N.N. Umunna, 1993. Alternative feed formulation in the developing countries: prospects for utilization of agro-industrial by- products. J. Anim. Prod. Res., 13: 63-98.

Alawa, J.P. and F.T. Oyarole, 2004. The effect of varying the roughage to concentrate ratio on the performance of growing rabbits. Bulletin of Animal Health and Production in Africa, 52: 263-265.

Aletor, V.A., 1986. Some agro-industrial by-products and wastes in livestock feeding; a review of prospects and problems. *World Review of Animal Production*, 22: 36-41.

Aletor, V.A. and O. Ogunyemi, 1990. The performance, haematology, serum constitutents and economics of producing weaner-pigs on dried brewer's gain. Nig. J. Techn. Res., 2: 85-89.

Berepubo, N.A., O.J., Owen, E.C. Chukuigwe, A. Monsi and U.I. Oji, 1995. Evaluation of "Sudden Death" syndrome in Rabbit colonies reared under different management systems in Port Harcourt, Rivers State. J. Innovation Life Sci., 2: 42-47.

Duncan, D.B., 1955. Multiple range and multiple F-tests. Biometric, 11: 1-42.

Fielding, D., 1991. Rabbits. In: Tropical agriculture Series, D. Fielding (ed). CTA/Macmillian Education Limited, London, p: 21-25.

Maynard, L.A., J.A. Loosli, H.F. Hints and H.S. Warner, 1979. Animal Nutrition. 7th ed. Taba Mcgraw-Hill, Bombay, India.

Mustapha, G.G. and O. Tunde, 1990. Var Siberiana Seeds. Nig. J. Anim. Prod., 17-20.

Oluyemi, J.A. and F.A. Robert, 1979. Poultry Production in Warm Wet Climate. London. Macmillian Publisher Ltd., pp: 32-44.

Owen, O.J., J.P. Alawa, S.N. Wekhe, N.O. Isirimah, E.C. Chukuigwe, A.O. Aniebo, E.M. Ngodigha and A.O. Amakiri, 2008. Incorporating Poultry Litter In Animal Feed: A Solid Waste Management Strategy. Egyptian J. Anim. Prod., In (press).

Senez, J.C., M. Rainbault and F. Deschamps, 1980. Protein enrichment of starchy substrates for animal feeds by solid-state fermentation. World Anim. Rev., 35: 36-39.

Smith, L.W. and W.E. Wheeler, 1979. Nutritional and Economic value of animal excreta. J. Anim. Sci., 48: 144-156.

Steel, R.G.D. and J.H. Torrie, 1990. Principles and Procedures of Statistics. 2nd Ed. MacGraw-Hill. Singapore.

Ukachukwu, S.N. and F.O.I. Anugwa, 1995. Biologic and economic effect of inducing different agro-industrial by products in turkey poult diets. Nig. J. Anim. Prod., 22: 137-140.