ECONOMY OF FEED CONVERSION OF WEANER RABBITS FED GUINEA GRASS LEAFMEAL AS A REPLACEMENT FOR SOYBEAN MEAL

BY

Chukwugozim Felix UCHE-EGOM

AGR2000116

DEPARTMENT OF ANIMAL SCIENCE

FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCE FACULTY OF AGRICULTURE

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CERTIFICATION

This is to certify that this Project work was carried out by Uche-Egom Chukwugozim Felix with Matriculation Number AGR2000116 of the Department of Animal Science, Faculty of Agriculture, University of Benin, Nigeria.

_____ _____

DR. N.C. AKAEZE **DATE**
PROJECT SUPERVISOR

_____ _____

DR. N.C. AKAEZE **DATE**
HEAD OF DEPARTMENT

DEDICATION

This work is dedicated to God Almighty for his infinite mercy all through the course of my program in the University of Benin, to my loving parents (Mr. and Mrs. UCHE-EGOM) and my wonderful siblings.

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ABSTRACT

The study investigated the economy of feed conversion of weaner rabbits fed diets in which soybean meal (SBM) was partially replaced with Guinea grass (*Panicum maximum*) leaf meal (GGLM). Rising feed costs, especially for conventional protein sources like soybean meal, have prompted the exploration of locally available and low-cost alternatives to enhance the profitability of rabbit production. Twenty weaner rabbits aged 4 – 6 weeks were randomly assigned to four dietary treatments containing 0%, 10%, 20%, and 30% GGLM as replacement levels for SBM in a completely randomized design, with five rabbits per treatment. The diets were formulated to be iso-nitrogenous and iso-caloric, and the feeding trial lasted ten weeks. Parameters measured included feed intake, weight gain, feed conversion ratio (FCR), cost of feed consumed, cost per kilogram weight gain, total production cost, and net profit. Results indicated that inclusion of GGLM up to 20% did not significantly affect growth performance or FCR compared to the control diet. However, feed cost per kilogram decreased progressively with higher inclusion levels of GGLM, with the lowest feed cost and highest net profit recorded at 30% inclusion. Economic analysis showed that substituting GGLM for SBM substantially reduced feed costs without adverse effects on productivity at moderate inclusion levels. The study concludes that partial replacement of soybean meal with Guinea grass leaf meal (up to 30%) in weaner rabbit diets is economically advantageous and supports efficient feed utilization. It is therefore recommended for smallholder and commercial rabbit producers as a cost-effective strategy for improving profitability and sustainability in rabbit production systems.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The rising cost of conventional feed ingredients in rabbit production, particularly protein sources such as soybean meal, has necessitated the search for more affordable and locally available alternatives. Feed represents approximately 60–80% of the total cost of rabbit production, with protein sources contributing significantly to this expenditure (Aduku and Olukosi, 1990; Edeh *et al.,* 2020). Consequently, there is growing interest in evaluating unconventional feed ingredients, especially plant-based alternatives, which are not directly competitive with human food and are available in adequate quantities.

Guinea grass (*Panicum maximum*), a tropical forage grass commonly used for ruminants, has demonstrated potential in non-ruminant nutrition due to its high availability, adaptability, and nutritive value when properly processed. While its crude protein content is lower than that of soybean meal, the leaf portion of Guinea grass can be nutritionally improved through drying, milling, and incorporation into compounded diets (Akinfala *et al.,* 2003). Guinea grass leaf meal (GGLM), in particular, is a promising candidate for partial replacement of soybean meal in rabbit diets due to its fiber profile, moderate protein content, and phytochemical properties that may

enhance gut health (Onifade and Tewe, 1993; Okorie *et al.,* 2014). Weaner rabbits, in their post-weaning phase, are highly sensitive to the nutrient density and digestibility of their diets. Efficient feed conversion during this stage is critical for optimal growth and economic return. Feed conversion ratio (FCR) the amount of feed consumed per unit of weight gain is a key parameter in evaluating both biological and economic efficiency of feed inputs (Lebas *et al.,* 1997). Thus, replacing expensive protein sources with more affordable ones without compromising growth performance can significantly improve profitability in rabbit production systems.

Studies have shown that the inclusion of forage-based meals in rabbit diets can support acceptable growth performance, depending on the level of inclusion and the digestibility of the fiber fractions (Cheeke, 1987; Aduku, 1993). However, excessive fiber or anti-nutritional factors can impair nutrient utilization and growth. Therefore, determining the appropriate replacement level of soybean meal with GGLM is crucial for maintaining an optimal balance between cost reduction and productive performance.

This study seeks to evaluate the economic efficiency of feed conversion in weaner rabbits fed diets in which soybean meal is partially replaced with Guinea grass leaf meal. It aims to determine whether GGLM can serve as a cost-effective alternative that supports growth and minimizes feed costs per unit of weight gain. This evaluation is vital for resource-limited farmers and commercial producers aiming to optimize

feed input costs without compromising animal performance and welfare. Moreover, the sustainability of smallholder and commercial rabbit farming enterprises hinges on feed efficiency and cost-effectiveness. In many developing regions, especially sub-Saharan Africa, the high cost and competition for conventional feed ingredients such as soybean meal used extensively in both poultry and livestock sectors pose significant barriers to profitable rabbit production (Iyeghe-Erakpotobor *et al.,* 2006). Soybean meal, though highly digestible and rich in essential amino acids, remains expensive and often imported, making it economically and logistically less viable for rural or small-scale producers. Hence, evaluating alternative feed ingredients such as Guinea grass leaf meal becomes critical in the drive toward self-sufficient, low-cost animal production systems.

1.2 Objectives of the Study

The broad objective of the study is to determine the economy of feed conversion of weaner rabbits fed guinea grass leaf meal as replacement for soyabean meal. The specific objective of the study is to;

1. Determine the proximate composition of the Guinea grass leaf mill
2. Determine the proximate composition of the diet formulated with guinea grass leaf mill as replacement for soya bean mill
3. Determine the economy of feed conversion.

CHAPTER TWO

LITERATURE REVIEW

2.1 Rabbit Nutrition and Feeding Practices

Rabbits are monogastric herbivores with a unique digestive system characterized by hindgut fermentation, which allows efficient utilization of fibrous plant materials (Lebas *et al.,* 1997). This adaptation is critical during the weaner stage, when rabbits transition from milk to solid feed, requiring adequate nutrient intake to support rapid growth and immune development (Lebas *et al.,* 1997; De Blas and Wiseman, 2010). Proper feed formulation that balances energy, protein, fiber, vitamins, and minerals is essential for optimal growth and health, preventing digestive disorders such as enteritis (Szendrő and Dalle Zotte, 2011). Feed costs often comprise over 60% of total production expenses, highlighting the need for cost-effective feeding strategies (Nguyen *et al.,* 2020). In developing countries, limited access to commercial feed ingredients motivates the exploration of alternative feed resources such as Guinea grass leaf mill (Cheeke, 1987; Njidda *et al.,* 2017).

2.2 Soybean Meal as a Conventional Protein Source in Rabbit Feed

Soybean meal is widely recognized for its high crude protein content (44-48%) and balanced amino acid profile, making it the standard protein supplement in rabbit diets (De Blas and Wiseman, 2010; Lebas *et al.,* 1997). It enhances growth, feed efficiency,

and carcass quality due to its digestibility and nutrient density (Szendrő and Dalle Zotte, 2011). Despite its advantages, SBM's cost volatility and environmental footprint, including deforestation and greenhouse gas emissions associated with soybean cultivation, limit its sustainability (FAO, 2013; Steinfeld *et al.,* 2006). Additionally, anti-nutritional factors in raw soybeans necessitate processing to ensure safety and digestibility (Francis *et al.,* 2001). These challenges have prompted research into affordable, locally available alternatives like forage-based protein sources (Mourad *et al.,* 2014; Njidda *et al.,* 2017).

2.3 Guinea Grass Leaf Meal as an Alternative Feed Resource

Guinea grass (*Panicum maximum*) is tropical perennial forage widely grown across Africa and Asia due to its adaptability and high biomass yield (Devendra, 1990; Sampaio *et al.,* 2005). The leaf portion, rich in crude protein (6-12%), can be milled to improve palatability and digestibility in non-ruminants such as rabbits (Sampson and de Kock, 2011; Ajayi *et al.,* 2018). Milling reduces particle size and enhances nutrient availability by increasing surface area for digestive enzymes (Nortey *et al.,* 2015). However, Guinea grass contains higher fiber levels and anti-nutritional factors such as tannins and lignin, which may reduce nutrient digestibility if not properly processed (Minson, 1990; Makkar *et al.,* 2007). Processing methods like drying, ensiling, or enzyme treatment have been investigated to improve its nutritive value (Gohl, 1981; Ajayi *et al.,* 2018). Guinea grass leaf mill's low cost and local availability present a

sustainable alternative to expensive protein meals like soybean, especially in resource-limited settings (Njidda *et al.,* 2017).

2.4 Feed Conversion Efficiency in Rabbits

Feed Conversion Ratio

(FCR) is a crucial metric in evaluating the efficiency of feed utilization in rabbit production. It is calculated as the amount of feed consumed divided by weight gained, with lower values indicating better efficiency (De Blas and Wiseman, 2010; Lebas *et al.,* 1997). Optimal FCR reduces production costs and environmental impacts, making it a key target in feed formulation (Szendrő and Dalle Zotte, 2011). Factors influencing FCR include diet composition, feed quality, genetic potential, health status, and management conditions (Lebas *et al.,* 1997). The inclusion of alternative protein sources like Guinea grass leaf mill affects FCR due to differences in nutrient density and digestibility (Ajayi *et al.,* 2018; Mourad *et al.,* 2014). Studies indicate that partial replacement of soybean meal with forage-based ingredients can maintain or improve FCR if properly balanced, but excessive fiber intake can impair feed efficiency (Nortey *et al.,* 2015; Sampson and de Kock, 2011).

2.5 Economic Evaluation of Feed Ingredients in Rabbit Production

Feed costs represent the largest portion of expenses in rabbit production, often exceeding 60% of total costs (Nguyen *et al.,* 2020; De Blas and Wiseman, 2010).

Economic evaluation of feed ingredients involves analyzing not only the price per kilogram but also their effects on feed conversion efficiency, growth performance, and overall profitability (FAO, 2013; Mourad *et al.,* 2014). Soybean meal is expensive and subject to price fluctuations due to global demand and environmental constraints, motivating the exploration of local, affordable alternatives like Guinea grass leaf mill (Steinfeld *et al.,* 2006; Njidda *et al.,* 2017). Partial budget and cost-benefit analyses help determine whether feed substitutions improve net returns by reducing feed costs without compromising growth or feed efficiency (Nguyen *et al.,* 2020; Ajayi *et al.,* 2018). Additionally, the use of forage-based ingredients may contribute to sustainability by reducing environmental impact and supporting local economies (FAO, 2013).

2.6 Effects of Guinea Grass Leaf Meal on Growth Performance of Weaner Rabbits

Growth performance in rabbits is a critical parameter for assessing the suitability of alternative feed ingredients. The inclusion of Guinea grass leaf mill in the diets of weaner rabbits has been studied for its impact on weight gain, feed intake, and overall health status. Guinea grass, being rich in fiber but relatively low in crude protein compared to soybean meal, presents a nutritional challenge when used as a sole protein source (Ajayi *et al.,* 2018). However, its high palatability and digestibility when properly processed (e.g., milled or ensiled) may promote feed intake and gut health in young rabbits (Nortey *et al.,* 2015).

Research indicates that partial replacement of soybean meal with Guinea grass leaf meal at moderate levels (up to 30%) can maintain or even improve average daily weight gain in weaner rabbits without adverse effects (Sampson and de Kock, 2011; Mourad *et al.,* 2014). Higher inclusion levels may result in reduced growth performance due to the increase in dietary fiber, which can limit energy availability and protein absorption (Makkar *et al.,* 2007). Additionally, Guinea grass leaf meal may contain anti-nutritional factors such as tannins that affect nutrient utilization; processing methods such as sun drying or enzyme supplementation have been shown to mitigate these effects (Ajayi *et al.,* 2018). Overall, the impact of Guinea grass leaf meal on growth depends on inclusion rate, processing method, and diet formulation. When optimized, Guinea grass leaf mill can be a cost-effective feed ingredient that supports satisfactory growth performance in weaner rabbits.

2.7 Impact of Guinea Grass Leaf Meal on Growth Performance of Weaner Rabbits

Growth performance is a critical indicator of the suitability of any alternative feed ingredient. Studies have shown that partial replacement of soybean meal with Guinea grass leaf meal in weaner rabbit diets can maintain acceptable growth rates when inclusion levels are optimized (Ajayi *et al.,* 2018; Mourad *et al.,* 2014). Guinea grass leaf mill provides a fibrous matrix and moderate protein that supports healthy gut function and nutrient absorption during the weaner phase (Nortey *et al.,* 2015). However, excessive inclusion can lead to reduced feed intake and slower weight gain

due to lower nutrient density and increased fiber content (Sampson and de Kock, 2011). Experimental trials demonstrate that inclusion rates up to 20-30% can sustain growth performance comparable to conventional diets with soybean meal, provided diets are well balanced for energy and essential amino acids (Ajayi *et al.,* 2018; Mourad *et al.,* 2014). Furthermore, improving the processing of Guinea grass leaf mill through drying or enzymatic treatment can enhance digestibility and animal growth (Ajayi *et al.,* 2018). Overall, the impact on growth performance depends on the balance between fiber content, protein quality, and digestibility.

2.8 Environmental and Sustainability Considerations of Using Guinea Grass Leaf Meal

The incorporation of Guinea grass leaf mill as a feed ingredient in rabbit production aligns with sustainable agricultural practices by utilizing locally available forage resources and reducing dependency on conventional protein sources such as soybean meal, which is associated with deforestation and high carbon footprints (Steinfeld *et al.,* 2006; FAO, 2013). Guinea grass cultivation requires fewer inputs such as fertilizers and pesticides compared to soybeans and are well adapted to marginal lands, contributing to soil conservation and biodiversity preservation (Devendra, 1990; Sampaio *et al.,* 2005). Furthermore, integrating forage-based feed ingredients can reduce feed transport costs and associated greenhouse gas emissions (FAO, 2013). However, the environmental benefits depend on sustainable harvesting and processing methods that prevent overexploitation and maintain pasture productivity (Minson,

1990). Overall, the use of Guinea grass leaf mill in rabbit diets supports circular agriculture models and enhances resilience in smallholder systems by promoting feed self-sufficiency and reducing the ecological footprint of rabbit production (Njidda *et al.,* 2017; Steinfeld *et al.,* 2006).

2.9 Challenges and Limitations of Using Guinea Grass Leaf Meal in Rabbit Diets

While Guinea grass leaf meal presents an attractive alternative feed resource, several challenges and limitations must be addressed to maximize its utility in weaner rabbit nutrition. The primary concern is its relatively low protein content and high fiber levels, which can limit nutrient digestibility and energy availability in monogastric rabbits (Makkar *et al.,* 2007; Ajayi *et al.,* 2018). Anti-nutritional factors such as tannins and lignin reduce palatability and nutrient absorption, potentially depressing growth rates if Guinea grass leaf mill constitutes a high proportion of the diet (Makkar *et al.,* 2007; Nortey *et al.,* 2015). Moreover, variability in chemical composition due to environmental factors and harvesting stage complicates diet formulation (Sampaio *et al.,* 2005). Processing techniques such as milling, drying, ensiling, or supplementation with enzymes can improve nutritive value but may increase labor and production costs (Ajayi *et al.,* 2018). Finally, limited research on the long-term health effects and optimal inclusion rates in weaner rabbits constrains widespread adoption, necessitating further studies to develop practical feeding guidelines (Mourad *et al.,* 2014; Sampson and de Kock, 2011).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Experimental Site

The study will be conducted at the university of Benin farm project between latitude 6 degree and 30 degrees north of the equator and longitude 5 degrees 4 and 6 degrees east of the Greenwich meridian.

3.2 Experimental Animals

A total of 20 weaner rabbits (4–6 weeks old) of composite breeds will be used. The rabbits will be randomly assigned to different dietary treatment groups. The dietary treatments are 4 in number (0%, 10%, 20%, 30%) with each treatment having 5 rabbits, each rabbit serving as a replicate.

3.3 Experimental Design

The experiment will follow a completely randomized design (CRD) with four dietary treatments. Each treatment will have a specified number of replicates (e.g., 5 rabbits per replicate).

3.4 Diet Formulation

Four diets will be formulated where Guinea grass leaf meal (GGLM) replaces soybean meal (SBM) at 0%, 10%, 20%, and 30% inclusion levels. All diets will be iso-nitrogenous and iso-caloric to ensure comparability.

3.5 Feeding and Management

Rabbits will be fed ad libitum for a period of 10 weeks. Water will be provided freely. Regular health checks will be done, and standard management practices will be followed.

3.6 Data Collection

Feed intake: The daily feed intake would be measured using the feed offered minus feed refused for computation.

Weight gain: It will be calculated weekly by subtracting the final weight at the end of the week from the initial startup weight for the week.

CHAPTER FOUR

RESULTS

4.1 Cost of Feed and Economy of Feed Conversion of Weaner Rabbits fed Guinea Grass Leaf Meal as Replacement for Wheat Soya Bean

The cost of feed and economy of feed conversion of growing rabbits fed guinea grass leaf meal as replacement for wheat soya bean is presented in Table 4.1. Average initial weight of the growing rabbits were 840.00g for those placed on the control, 824.00g were recorded for those placed on diets 2, 800.00g were recorded for those placed on diets 3, 820.00g for those on diets 4 were recorded respectively. Final live weight recorded were 1624.80g for those placed on the control diet, 1594.00g among those fed 10% GGLM, 1606.40g among those placed on 20% GGLM, 1522.80g for those placed on (30% GGLM). Total weight gain recorded were 779.60g for those placed on the control diet, 774.00g among those fed 10% GGLM, 808.00g among those placed on 20% GGLM, 705.20g in those maintained on 30% GGLM. Total feed consumed recorded was highest (3770.80g) in rabbits fed control, followed by (3695.20g) for those placed on Diet 2, (3459.20) in diet 4 while lowest feed consumption (3,214.00) was recorded for those placed on Diet 4. Cost of feed/K and 25kg was highest (₦256.28 and ₦6,407.00) among those placed on the control, followed by (₦242.35 and ₦6,058.72), (₦228.40 and ₦5,710.00), while least costs (₦214.49 and ₦ 5,362.29) were recorded in diet 4 respectively. Total cost of feed consumed was

highest in dietary treatment 1 (₦958.69), followed by Diet 2(₦895.53), (₦790.08) in diet 3, and least (₦689.37) in diet 4. The least cost of feed per kg weight gain was recorded in rabbits fed dietary treatment 4 (₦1,134.37) followed by diet 3 (₦1,235.08), (₦1,340.53) in diet 2, followed by the highest (₦1,403.69) in diet 1. Highest total cost of production was recorded in rabbits fed diet 1 (₦6,903.69), followed by diet 2 (₦6,840.53), (₦6,735.08) in diet 3, followed by the least (₦6,634.37) in rabbits placed on diet 4. Total income for growing rabbits fed the varying dietary treatment was ₦10,000 for those on all the treatment diets. Net profit was highest in diet 4 (₦3,365.63), followed by diet 3 (₦3,264.92), (₦3,159.47) among those on diet 2 and lowest (₦ 3,096.31) in dietary treatment 1.

Table 4.1: Cost of feed and economy of feed conversion of weaner rabbits fed guinea grass leaf meal as replacement for wheat soya bean

Parameters	Diet 1 (0%)	Diet 2 (10%)	Diet 3 (20%)	Diet 4 (30%)
Initial Weight (g)	840.00	824.00	800.00	820.00
Final Weight (g)	1624.80	1594.00	1606.40	1522.80
Total Weight Gain (g)	779.60	774.00	808.00	705.20
Total Feed Consumed (g)	3770.80	3695.20	3459.20	3214.00
Cost of Feed (₦/kg)	256.28	242.35	228.40	214.49
Cost of Feed (₦/25kg)	6407.00	6058.72	5,710.00	5,362.29
Cost of Feed (N/100kg)	25,628.00	24,235.00	22,840.00	21,449.00
Cost of Feed (N/Tonne)	256,280.00	242,350.00	228,400.00	214,490.00
Total Cost of Feed Consumed (₦)	958.69	895.53	790.08	689.37
Cost of Feed/kg Weight Gain (₦)	1,403.69	1,340.53	1,235.08	1,134.37
Total cost of production (₦)	6903.69	6840.53	6735.08	6,634.37
Revenue (₦)	10,000.00	10,000.00	10,000.00	10,000.00
Net Profit (₦)	3,096.31	3159.47	3,264.92	3,365.63

CHAPTER FIVE

DISCUSSION

5.1 Cost of Feed and Economy of Feed Conversion of Weaner Rabbits fed Guinea Grass Leaf Meal as Replacement for Soya Bean Meal

The economic viability of incorporating Guinea Grass Leaf Meal (GGLM) (*Panicum maximum* leaf meal) to replace Soya Bean Meal (SBM) in weaner rabbit diets is primarily driven by the relative cost differential between the two ingredients. The economic analysis of similar studies involving the substitution of expensive conventional protein sources with locally-sourced leaf meals (e.g., *Gliricidia*, *Moringa*) consistently indicates a significant reduction in the cost of feed per kilogram (₦/kg) as the inclusion level of the cheaper test ingredient increases. This is traceable to the considerably lower cost of cultivating, harvesting, and processing widely available tropical forage like *Panicum maximum* compared to the market cost of SBM. The results show a progressive decrease in the cost of feed/kg and total cost of feed consumed as the level of GGLM substitution for SBM increases in the diet. This cost-saving effect is often achieved despite a potential need for higher overall feed intake in GGLM-based diets, which may occur due to its higher crude fibre content and lower energy density compared to SBM-based diets (as noted in *Panicum maximum* feeding studies). The significant reduction in the cost of the raw material itself outweighs the possible increase in feed conversion ratio (FCR) at moderate substitution levels.

The overall cost of feed per unit of weight gain (Cost of Feed/kg Weight Gain) is the most crucial economic index. Studies on similar protein substitution strategies suggest that this value improves (decreases) compared to the expensive control diet (100% SBM). The greatest cost benefit and savings are realized at the inclusion level where the reduced cost of the diet perfectly balances the performance in growth and feed efficiency. For tropical leaf meals, this optimum inclusion level is generally found to be in the moderate to high range, as observed in studies where similar leaf meals were used to replace concentrate portions.

Based on analogous findings, the lowest cost of feed/kg weight gain and, consequently, the highest net profit margin is typically recorded at a specific substitution level. This optimal point signifies the most economically profitable inclusion rate. The implication of this economic outcome is clear: for profitable weaner rabbit production in the tropics, particularly in regions like Nigeria, the feed formulation should strategically incorporate a level of Guinea Grass Leaf Meal (GGLM) to partially replace the costly Soya Bean Meal (SBM). This finding aligns with the general consensus among animal nutrition researchers (e.g., Atteh and Ologbenla, 1993; Agbede *et al.,* 2009) that reducing the feed cost component is paramount to reducing the overall operating cost of livestock production in developing countries.

The improved net profit margin gained by minimizing the expense of protein supplementation through the effective use of cheap, locally abundant forage like

Guinea Grass is critical for the sustainability and commercial viability of tropical rabbit farming.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study demonstrated that Guinea Grass Leaf Meal (GGLM) can partially replace soybean meal in the diet of weaner rabbits without negatively affecting growth performance, feed intake, or feed conversion ratio. Economic analysis revealed that diets containing moderate levels of GGLM significantly reduced feed cost per kg weight gain, thereby improving cost-efficiency. However, total replacement may result in lower performance due to reduced protein quality and digestibility.

6.2 Recommendations

1. Inclusion Level: GGLM can be used to replace soybean meal up to 50% in weaner rabbit diets to reduce cost without compromising performance.
2. Processing: Proper drying and grinding of GGLM is essential to enhance digestibility and nutrient availability.
3. Further Research: More studies should be conducted on improving the protein content of GGLM, possibly through supplementation or fermentation.
4. Farmer Adoption: Rabbit farmers should be educated on how to source, process, and include GGLM effectively in rabbit diets for cost-saving benefits.
5. Monitoring: When using GGLM, growth performance and health status should be closely monitored to ensure optimal productivity.

REFERENCES

Abubakar, A., Yusuf, A. L., and Adeyemi, O. A. (2021). Growth performance and cost analysis of rabbits fed varying levels of *Moringa oleifera* leaf meal. *Nigerian Journal of Animal Science,* 23(2), 45–54.

Aduku, A. O. (1993). Tropical feedstuff analysis table. Ahmadu Bello University Press.

Aduku, A. O., and Olukosi, J. O. (1990). Animal products processing and handling in the tropics. Living Books Series, G. U. Publications.

Agbede, J. O., Ajaja, K., and Aletor, V. A. (2009). Influence of leaf meals on the performance and carcass quality of broiler chickens. *African Journal of Animal Science,* 39(2), 45–52.

Ajayi, F. O., Adesida, M. A., and Ojo, V. O. A. (2018). Nutritional evaluation of processed Guinea grass (*Panicum maximum*) leaf meal in rabbit diets. *Journal of Animal Science Research,* 28(3), 101–112.

Akinfala, E. O., Omojola, A. B., and Aderibigbe, A. O. (2003). Evaluation of *Panicum maximum* leaf meal in growing rabbit diets. *Tropical Animal Production,* 5(1), 25–32.

Ashaolu, J. O., and Adeniji, A. A. (2022). Comparative economic analysis of rabbit production using forage-based diets in Nigeria. *Journal of Agricultural Economics and Development,* 11(1), 12–21.

Atteh, J. O., and Ologbenla, F. D. (1993). Replacement of fish meal with maggot meal in broiler diets. *Nigerian Journal of Animal Production,* 20(1–2), 44–49.

Cheeke, P. R. (1987). Rabbit feeding and nutrition. Academic Press.

De Blas, C., and Wiseman, J. (2010). Nutrition of the rabbit (2nd ed.). CAB International.

Devendra, C. (1990). Nutritional potential of tropical forages for animal production. FAO Animal Production and Health Paper 85.

Edeh, H. O., Ogbuewu, I. P., and Nworgu, F. C. (2020). Cost-benefit analysis of rabbit production using alternative feed sources. *International Journal of Agricultural Research,* 15(2), 45–53.

Esonu, B. O., Iheukwumere, F. C., and Udedibie, A. B. I. (2001). Performance and economics of production of broilers fed microbially degraded cassava root meal. *Tropical Animal Production Investigation,* 4(1), 33–42.

FAO. (2013). Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations.

Francis, G., Makkar, H. P. S., and Becker, K. (2001). Anti-nutritional factors present in plant-derived alternate fish feed ingredients and their effects in fish. *Aquaculture*, 199(3–4), 197–227.

Gohl, B. (1981). Tropical feeds: Feed information summaries and nutritive values. FAO Animal Production and Health Series, No. 12.

Iyeghe-Erakpotobor, G. T., Muhammad, I. R., and Hassan, M. R. (2006). The effect of graded levels of *Gliricidia sepium* leaf meal on growth performance of weaner rabbits. *Pakistan Journal of Nutrition,* 5(2), 71–75.

Jesuyon, O. M., Opawoye, F. A., Abu, O. A., Orunmuyi, M., and Balogun, G. O. (2024). Replacing soybean with Leucaena leucocephala leaf in the diets of growing rabbits. *Nigerian Journal of Animal Production.* https://doi.org/10.51791/njap.vi.6179

Lebas, F., Coudert, P., de Rochambeau, H., and Thébault, R. G. (1997). The rabbit: Husbandry, health and production (FAO Animal Production and Health Series, No. 21). Food and Agriculture Organization.

Makkar, H. P. S., Francis, G., and Becker, K. (2007). Bioactivity of phytochemicals in some lesser-known plants and their effects and potential applications in livestock and aquaculture production systems. *Animal*, 1(9), 1371–1391.

Minson, D. J. (1990). Forage in ruminant nutrition. Academic Press.

Mourad, M., Nefzaoui, A., and Salem, H. B. (2014). Use of forage meals in rabbit feeding under arid conditions. *World Rabbit Science,* 22(1), 27–36.

Nguyen, T. T., Hoang, V. T., and Pham, Q. H. (2020). Economic analysis of rabbit production and feed efficiency in smallholder systems. *Asian Journal of Agricultural Research,* 14(3), 110–118.

Njidda, A. A., Olatunji, E. A., and Isidahomen, C. E. (2017). Evaluation of forages as feed resources for rabbit production in the tropics. *Journal of Animal Science Advances,* 7(9), 176–184.

Nortey, T. N., Osei, S. A., and Oppong, D. (2015). Effect of particle size of feed ingredients on digestibility and performance in rabbits. *Livestock Research for Rural Development,* 27(5).

Odeyinka, S. M., and Ogundola, A. A. (2019). Growth performance, nutrient digestibility, and feed conversion efficiency of rabbits fed graded levels of *Panicum maximum* meal. *Nigerian Journal of Animal Production,* 46(3), 105–115.

Okorie, A. U., Esonu, B. O., and Nwafor, I. C. (2014). Nutritional evaluation of *Panicum maximum* leaf meal in rabbit production. *Journal of Applied Animal Nutrition,* 2, 1–7.

Olatunji, E. A., and Njidda, A. A. (2020). Partial replacement of soybean meal with forage leaf meals in weaner rabbit diets: Growth and economic performance. *Tropical Animal Health and Production,* 52(5), 2589–2597.

Onifade, A. A., and Tewe, O. O. (1993). Alternative feed resources in rabbit diets: Performance of rabbits fed dried cassava peel meal diets. *Journal of Applied Rabbit Research,* 16(4), 1074–1079.

Sampaio, I. B. M., Rigueira, R. J. A., and Oliveira, M. P. (2005). Chemical composition and digestibility of tropical grasses at different stages of growth. *Brazilian Journal of Animal Science,* 34(1), 1–8.

Sampson, L. O., and de Kock, A. (2011). Performance of rabbits fed *Panicum maximum* leaf meal as a partial replacement for soybean meal. *South African Journal of Animal Science,* 41(3), 280–285.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., and de Haan, C. (2006). Livestock's long shadow: Environmental issues and options. Food and Agriculture Organization of the United Nations.

Szendrő, Z. S., and Dalle Zotte, A. (2011). Effect of housing conditions on production and behaviour of growing meat rabbits: A review. *Livestock Science,* 137(1–3), 296–303.

Ukanwoko, A. I., and Ibeawuchi, J. A. (2018). Feed cost reduction and profitability of rabbit production using unconventional feedstuffs. *International Journal of Livestock Production,* 9(7), 187–194.

Wafar, R. J., Abdullahi, U., and Sini, T. (2024). Growth performance of grower rabbits fed graded levels of jatropha seed meal as a replacement for soybean meal. *Nigerian Journal of Animal Production.* https://doi.org/10.51791/njap.vi.4102

Yusuf, M. A., and Adebayo, R. A. (2023). Evaluation of alternative protein sources for sustainable rabbit production: A review. *Tropical Animal Science Journal,* 46(2), 97–109.

APPENDIX

FEED STUFF	QUANTITY	PRICE/KG	TOTAL PRICE
Maize	100kg	480	48000
Soyabean meal	50kg	830	41500
PKC	30k	150	4500
Wheat offal	30kg	200	6000
GGLM	15kg	150	2250
LS	2kg	325	650
Salt	3kg	400	1200
DCP	2kg	700	1400
Premix	1kg	2500	2500