DEPARTMENT OF SOIL SCIENCE AND TECHNOLOGY
SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY
FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI

PROCEDURE FOR MAKING
BOKASHI

What is Bokashi?

Bokashi is an organic input produced by half-cooking organic materials in a carefully controlled way. Half-cooking means the materials used to make Bokashi don't get completely decomposed during the Bokashi making process.

What materials do I need to make Bokashi?

To make Bokashi, one needs the following:

- 7 by 50kg sacks of manure as a source of nutrients and microbes. Any kind of manure can be used, although a mixture of manures is best and it is better if the manure is dry.
- 7 by 50kg sacks of dry materials such as maize stover, rice husk, dry leaves or even sawdust. A mixture of materials is best. The dry materials should be cut in small pieces to make it easy to turn the heap.
- 5 by 50kg sacks of soil preferably clay or native soil. Soil is a good source of microbes for the Bokashi.
- 1 by 50kg sack of biochar (optional). Biochar provides a very good environment for microbes.
- 1 by 50kg sack of rice, wheat or maize bran. Bran is very good food for the microbes.
- 5l of molasses. Molasses is a good energy source for microbes. If you can't get molasses you can use 2kg sugar made into syrup (dissolve the sugar in water) but molasses is better and cheaper.
- 500g yeast to speed-up the fermentation process and help the microbes to multiply fast.
- Rock dust or bone meal as source of minerals. If these materials are unavailable, ash can be used.
- Water with no chlorine in it.

Please note: the quantities given above are merely a guide and can easily be adjusted depending on the quantity of Bokashi that one needs and on the availability of the materials.

Step-by-step guide for making Bokashi

Step 1.
Choose a site that is protected from the rain, wind and direct sunlight.

Step 2.
Mix some molasses and yeast in 5L of water and sprinkle the mixture on the set of layers.

Step 3.
Start by placing a layer of dry agro-waste, sprinkle the mixture of molasses and yeast on the layer, then place a layer of animal manure and sprinkle the mixture on the second layer. Add a layer of soil and sprinkle the mixture of molasses and yeast on the layer; add biochar and also sprinkle the mixture of molasses and yeast and finally add wheat bran.

Step 4.
Sprinkle the final mixture of molasses and yeast on top of the whole mixture.

Step 5.
Turn the heap so that all the layers become mixed together.

Step 6.
Sprinkle some water as you turn the heap. Be careful not to add too much water. The heap should be turned 3 to 4 times to ensure that all the materials are well mixed and right.

Step 7.
Use the squeeze test to check if enough water has been added i.e. take a fistful of the mixed Bokashi material and squeeze it. If water comes out between your fingers, you have too much water. If the material can't form a sausage shape when you roll it in your hands, then you have too little water. If there is too much water, turn the heap again and add more soil as you turn. If there is little water, turn the heap and sprinkle more water. Note: after the first day, no more water is to be added to the Bokashi heap.

Step 8.
Managing the Bokashi Heap: Insert a soil thermometer in the Bokashi heap and leave it for about 10 seconds. If the temperature is between 25 - 30°c, it means the temperature is adequate. The pH and moisture content of the heap should be taken for the first 4 days, turn the heap twice a day in the morning and evening. If the heap reads 45°c and above after inserting the soil thermometer, it means the heap is too hot and there is need to lower the height of the heap.

Step 9.
From the 5th day, turn the heap once a day until the temperature becomes the same as that of the surrounding. This is usually 12 - 15 days from the day when the heap was made. At this point, the Bokashi is ready for use.
Use Bokashi soon after it has been made as it will be strongest (remember the decomposition process will still be going on even after the Bokashi making process is completed).

Cassava based feed composites
A game changer for Nigeria's livestock

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Problem Being Addressed

The livestock industry in Nigeria faces significant challenges due to the scarcity and high cost of maize, a primary feed ingredient. This has resulted in skyrocketing costs of animal products such as meat and eggs, making them unaffordable for many Nigerians. The industry's reliance on maize also underscores the need for innovative, cost-effective alternatives that can ensure sustainable livestock production

Table 1. Live weights and cost analysis broiler chickens fed wet and sundried FEMCARPP as replacements for maize .

Parameters	Maize	FEMCARPP Wet	FEMCARPP Dried
Final live weight @ 7 weeks (g)	2272.2	2005.6	2177.8
Av. daily feed intake (g/day)	121.92	99.73	121.71
Feed conversion ratio	2.35	2.36	2.51
Feed cost (N/kg)	102.63	81.60	87.63
Feed cost per kg weight gain (N)	311.43	244.66	277.19
Cost savings per Kg meat produced (N)	0.00	66.77	34.24

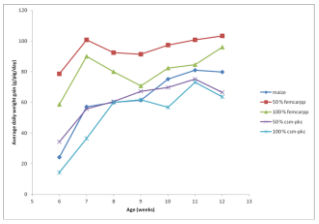

Chart 1. Live weights of weaner pigs fed diets containing the cassava-based feed composite Vs maize and cassava diets

Innovation Summary

Our groundbreaking technology utilizes solid-state fermentation to transform blends of cassava with palm kernel cake and okara (a soymilk production byproduct) into a nutrient-rich feed composite. This process not only enhances the physicochemical characteristics and nutrient profiles of the feed but also produces a product that can potentially replace maize in poultry, pig, and other livestock diets at a significantly lower cost

Key Features & Advantages

- ➢ **Cost-effective**: Reduces reliance on expensive maize, lowering feed costs and increasing profitability for farmers.
- ➢ **Nutrient-rich**: Enhances the nutritional value of the feed, promoting healthier livestock growth and development.
- ➢ **Probiotic potential**: The fermentation processes use microbes labelled as GRAS (Generally Regarded as Safe) by the WHO, with demonstrated probiotic potentials. This further reduce the need for in-feed antibiotics and synthetic growth promoters, ensuring safer food for consumers.
- ➢ **Sustainable**: Utilizes locally available cassava and low-cost agricultural byproducts, thus reducing waste and promoting sustainable agriculture practices.

Market & Impact

- ❖ **Increased value chain for cassava:** the technology has capacity to absorb any excess during periods of glut and hence guarantee stable farmgate price for cassava farmers.
- ❖ Spare more grains for food, brewing and beverage productions
- ❖ Increase demand for animal food products through reduced price and productivity
- ❖ We invite investors, partners, and stakeholders to join us in revolutionizing the livestock industry with our innovative solid-state fermented cassava -based composites. Together, we can make a significant impact on food security, sustainability, and the livelihoods of farmers and consumers alike.

Technical Details

TRL Level - 7:
A prototype is demonstrated in an operational environment.

- IP Status: Nill

-Supporting Evidence

- **Aladi (2016)** STUDIES ON DIETARY FERMENTED MIXTURE OF CASSAVA AND PALM KERNEL CAKE ON CARCASS CHARACTERISITCS . PhD thesis
- **Chukwukaelo et al. (2018).** https://doi.org/10.1007/s11250-017-1457-7
- **Aladi et al. (2018).** https://doi.org/10.1007/s00580-017-2519-y
- **Aladi et al. (2021)**. https://doi.org/10.1007/s11250-021-02687-2

Figure 1. Blend of cassava, palm kernel cake and/or okara

Figure 2. Solid state fermented feed composites

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FUTO@45 Innovation Showcase & Dealroom

LoPoAsh Feed Additive: A processed Bioactive Ash for the Poultry Industry

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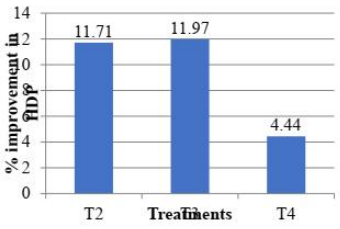
Problem Being Addressed

The poultry industry's reliance on inorganic mineral mixes and rock mineral sources leads to excessive mineral excretion, environmental pollution, and poor bioavailability. Current organic trace mineral products are expensive and inaccessible to small holder farmers.



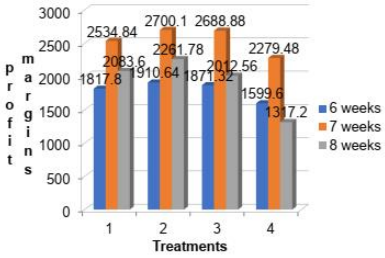


Chart 1: improvement in hen day production (HDP) in layers
Chart 2: Profit margin of broilers fed with LoPoAsh

Innovation Summary

- ✓ Our innovation involves the production of a low-potassium palm bunch ash (LoPoAsh) feed additive, which provides a cost-effective and sustainable solution for poultry farming.
- ✓ LoPoAsh improves mineral absorption, reduces excessive mineral excretion, and enhances poultry performance

Key Features & Advantages

- ***Simple and cost-effective:*** LoPoAsh is produced using a simple method, making it a cost-effective alternative to commercial organic trace mineral products
- ***Improved poultry performance:*** LoPoAsh improves egg laying performance by up to 12% and broiler final body weight by 105g after 49 days (7 wks) of feeding
- ***Eco-friendly:*** LoPoAsh reduces excessive mineral excretion, resulting in more environmentally friendly poultry farming practices

Market & Impact

- CLoPoAsh has significant commercial potential, particularly in low – income countries where smallholder farmers dominate the poultry industry. The market demand for affordable and sustainable feed solution is high and our product can capitalize on this trend.
- Potential applications include: Poultry feed production, Smallholder farming systems, Sustainable agriculture practices, Environmental pollution reduction

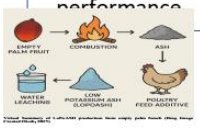


Figure 1. summary of LoPoAsh production

Figure 2. impact of LoPoAsh application

Table 1: mineral concentration of raw ash and processed ash.

Parameters	RA	SFA
P (mg/kg)	30,200	37,800
Ca (mg/kg)	55,500	74,700
Mg (mg/kg)	26,900	41,800
K (mg/kg)	209,700	164,300
Na (mg/kg)	15,800	11,800
Mn (mg/kg)	1283.01	1817.54
Fe (mg/kg)	1038.92	1448.22
Cu (mg/kg)	204.02	303.17
Zn (mg/kg)	375.25	507.92
Co (mg/kg)	0.00	0.00
Cr (mg/kg)	2.32	108.98
Cd (mg/kg)	4.57	3.51
Lead (mg/kg)	39.83	0.00

Technical Details

TRL Level:
The technology has been developed and tested in a relevant environment with successful results demonstrating improved poultry performance and reduced environmental impact. We seek investment to scale up production, refine the ash treatment process and explore new market opportunities.
- IP Status: not yet patented.
- Supporting Evidence: Published outputs

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FUTO@45 Innovation Showcase & Dealroom

Velvet Tamarind Stem Bark-Based Feed Additive: A New Path For Nigeria's Poultry Industry

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Problem Being Addressed

- Feed accounts for about 60-70% of the overall cost of broiler farming under the intensive system of production calling for optimization of nutrient utilization in the Nigeria poultry industry using imported expensive feed additives such as antibiotics and phytogenic feed additive.
- The industry's reliance on imported expensive plant-based feed additives also underscores the need for innovative, cost-effective alternatives that can ensure sustainable poultry production in Nigeria.

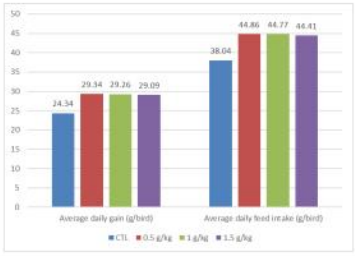

Chart 1. ADG and ADFI of growing broilers

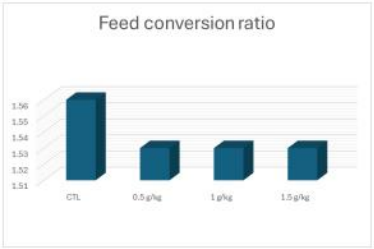

Chart 1. FCR of growing broilers.

Innovation Summary

- Our groundbreaking technology utilizes enzyme technology to transform tamarind velvet bark (Figure 1) into an eco-friendly nutrient and bioactive-rich feed additive (Figure 2).
- This process not only enhances the physicochemical characteristics and nutrient profiles of the feed but also produces a product that can potentially replace imported feed additive in poultry and other livestock feed at a significantly lower cost.

Figure 1. Velvet tamarind stem bark (VB)

Figure 2. VB – Enzyme mix

Key Features & Advantages

- Cost-effective: Reduces dependency on imported expensive feed additives, optimize nutrient utilization and increase profitability for farmers.
- Increased performance: VBE-mix improves weight gain and feed conversion efficiency.
- Reduction on in-feed antibiotics use: This reduces the need for in-feed antibiotics and synthetic growth promoters, ensuring safer and quality animal food for consumers.
- Sustainable: Utilizes locally available tree bark in promoting eco-friendly and sustainable poultry farming.

Market & Impact

- Provides a cost-effective, nutrient-rich, and safer feed alternative, our technology has the potential to transform the poultry industry in Nigeria.
- It can increase the affordability of meat , improve farmer profitability, and contribute to a more sustainable and food-secure future.

Technical Details

TRL Level: 7
A prototype is demonstrated in an operational environment

IP Status: None

- Supporting Evidence: Analyzed Field data

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