SOLID-STATE FERMENTED POULTRY FEED: A CLIMATE-SMART AGRICULTURAL INITIATIVE

by

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INTRODUCTION

Climate-smart agriculture (CSA) is an integrated approach to sustainable farming that enhances productivity, increases resilience to climate change, and reduces greenhouse gas emissions (Bhanuwanti *et al.,* 2024). Its main goals are food security, minimal environmental impact, and efficient resource use. Solid-state fermentation (SSF) aligns with CSA by converting agricultural waste into high-quality poultry feed, reducing livestock's carbon footprint. SSF supports antibiotic-free poultry farming, enhances nutrient availability, and improves feed digestibility, helping to curb deforestation and environmental degradation while promoting sustainable agriculture.

CLIMATE SMART AGRICULTURE (CSA)

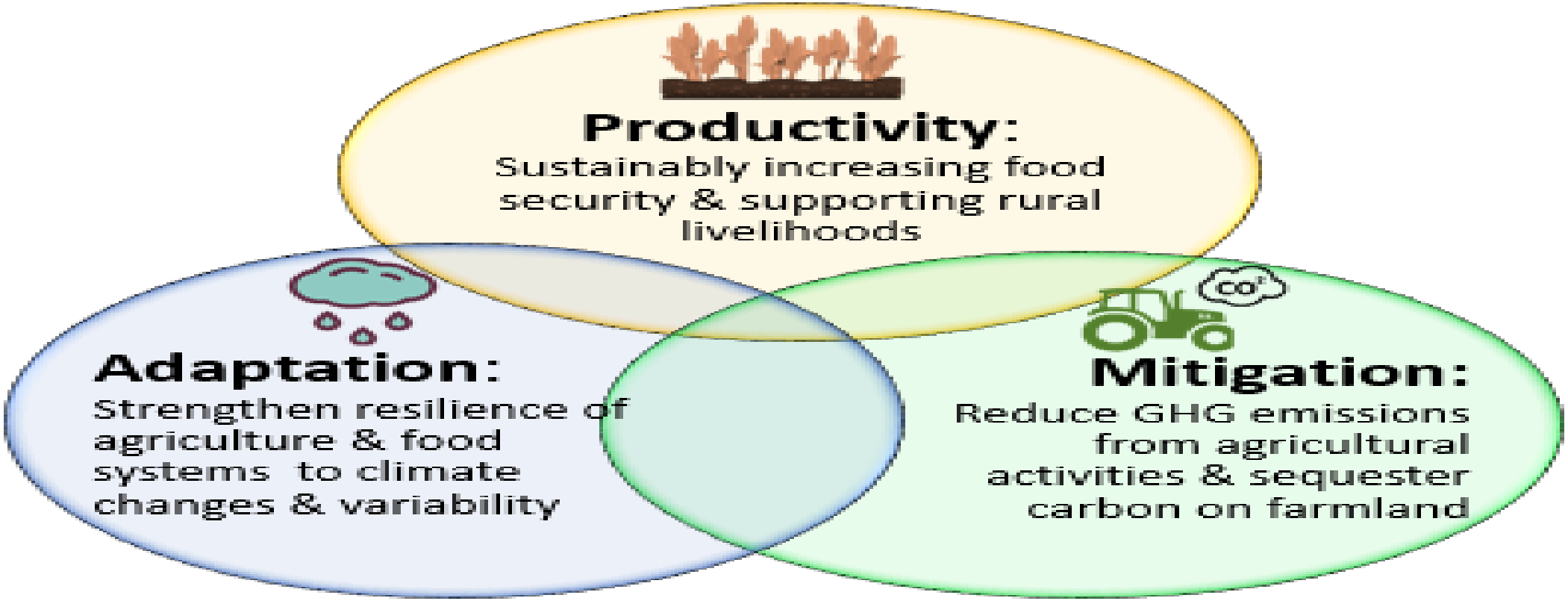
The 3 main goals of CSA:

Agricultural Productivity: Increase agricultural and livestock production in a sustainable manner to improve food security and farmers' livelihoods.

Greenhouse Gas (GHA) reduction: Reduce your carbon footprint by using sustainable practices including better waste management, less deforestation, and efficient resource use.

Improving climate change resilience: Boost agricultural systems' capacity to endure harsh weather and adjust to climate change.

CLIMATE SMART AGRICULTURE



Sustainability initiative of South Africa (NPC, 2016)

POULTRY FEED

The most expensive and essential part of raising chickens is poultry feed (B. Abbas, 2023). The need for feed components is rising as the world's poultry consumption rises, especially in emerging nations. Alternative, locally accessible feedstuffs must be investigated because traditional feedstuffs like maize and soybean meal are running out. Advances in poultry nutrition aim to understand nutrient metabolism, determine nutrient availability in feed ingredients, and formulate cost-effective diets The goal is precision feeding to lower costs, maximize economic efficiency, and reduce nutrient excretion, which can be a source of pollution.

MAJOR PROBLEMS OF FEED PRODUCTION

Cost of Poultry Feed: The rising prices of conventional feed ingredients like maize and soy increase production costs, making poultry farming less profitable.

Resource Scarcity: Limited availability of essential feed components due to climate change, land degradation, and competition for agricultural resources.

Environmental Degradation: Unsustainable feed production contributes to deforestation, water pollution, and greenhouse gas emissions, harming ecosystems.

SOLID STATE FERMENTATION (SSF)

A promising biotechnology method for producing high-quality animal feed from agricultural and agro-industrial waste, solid-state fermentation (SSF) has both financial and environmental advantages (Parmar *et al.,* 2019). By boosting digestibility, decreasing anti-nutritional factors, and raising protein content, SSF raises the nutritional value of these residues (Godoy *et al.,* 2018; Yafetto *et al.,* 2023). Numerous value-added products, like as vitamins, bioactive ingredients, and enzymes, can be produced by this process. These compounds help to improve gut health, animal performance, and lower enteric methane emissions (Parmar *et al.,* 2019). For both ruminants and non-ruminants, SSF-treated feed has demonstrated favorable effects on animal growth, biochemical condition, and carcass characteristics (Parmar *et al.,* 2019).

BENEFITS OF SSF IN POULTRY FEED PRODUCTION

S/N	Benefit	Description
1	**Enhanced Nutritional Value**	Increases protein content, amino acid availability, and bioactive compounds in feed.
2	**Improved Digestibility**	Breaks down anti-nutritional factors, making nutrients more accessible to poultry.
3	**Better Gut Health**	Promotes beneficial probiotics, reducing the risk of gut infections and improving immunity.
4	**Reduced Feed Wastage**	Enhances feed conversion efficiency, ensuring better nutrient utilization.
5	**Environmental Sustainability**	Reduces greenhouse gas emissions and feed waste, contributing to climate-smart agriculture.
6	**Cost-Effectiveness**	Utilizes agro-industrial byproducts, reducing dependency on expensive conventional feed ingredients.
7	**Lower Use of Antibiotics**	Natural probiotics and bioactive compounds reduce the need for synthetic antibiotics, promoting healthier poultry production.

SOME AGRICULTURAL WASTES USED IN SSF

RICE BRAN, WHEAT BRAN	Yeast (e.G., *Saccharomyces cerevisiae*)	Nutrient utilization Improved animal health	Weight gain Lowers cholesterol level Increased immunity	Liza *et al.,* 2022; He *et al.,* 2021
CASSAVA PEELS	Bacteria or Fungi (e.g., *Bacillus spp.*, *Aspergillus spp.)*	Nutrient Utilization	Weight Gain	Aladi *et al., 2022*
GROUNDNUT CAKE	Yeast or Fungi	Protein Digestibility	Promoting muscle development in poultry.	Ghosh and Mandal, 2015
BANANA PEELS	Lactic Acid Bacteria or Yeast	Gut Health	Reducing digestive disorders in poultry.	Fatmawati *et al.,* 2018
ORANGE PEELS	Fungi (e.g., *Aspergillus spp.)*	Toxin Mitigation	Reducing health risks in poultry.	Oluremi *et al.,* 2008
PALM KERNEL CAKE	Bacteria or Fungi (e.g., *Aspergillus spp*.)	Nutrient Availability	Weight Gain.	Nurhayati, 2008

SSF AND THE ENVIRONMENT

- Waste Reduction and Resource Utilization: Converts agricultural byproducts into value-added feed, reducing landfill waste and promoting sustainability.
- Lower Greenhouse Gas Emissions: Minimizes methane emissions from decomposing agro-waste and reduces the carbon footprint of feed production.
- Soil and Water Conservation: Prevents excessive agricultural waste disposal, improves soil health, and reduces nutrient runoff that causes water pollution.
- Alternative to Deforestation-Driven Feed Ingredients: Reduces reliance on deforestation-linked feed sources like soy and maize by utilizing agro-forestry residues.

SSF AND THE ENVIRONMENT CONT.D

- Antibiotic-Free Poultry Production: Produces probiotic-rich feed, decreasing the need for synthetic antibiotics and lowering antibiotic resistance risks.
- Sustainable Circular Economy: Encourages eco-friendly farming by repurposing agricultural waste into high-value poultry feed.
- Climate-Smart Agriculture: Supports low-carbon livestock production, aligning with global climate action goals for sustainable food systems.

CONCLUSION

As a climate-smart agriculture practice, SSF enhances environmental sustainability and promotes food security, making it a crucial tool in Africa's response to climate change. SSF is a positive driver of climate change adaptation and resilience in Africa by reducing GHG emissions from poultry farming. Its use in poultry farming promotes circular agriculture, prevents deforestation for feed crop production, and supports sustainable food systems.

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PICTURES

UNFERMENTED AND FERMENTED FEED MATERIALS

THANK YOU ALL FOR LISTENING