ECONOMICS OF SEED STORAGE, DETERIORATION AND LONGEVITY IN OKE-OGUN, OYO STATE, NIGERIA

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Abstract

Seed storage is critical for maintaining seed viability, preserving genetic resources, and ensuring agricultural productivity. However, deterioration during storage remains a major challenge, particularly in tropical environments with high temperatures and humidity. This study examined the economics of seed storage, deterioration, and longevity among agricultural stakeholders in Oke-Ogun, Oyo State, Nigeria. A cross-sectional survey design was used, and data were collected from 100 respondents, including farmers, seed marketers, agro-dealers, and extension stakeholders, using a structured questionnaire. Data were analyzed using descriptive statistics and Pearson Product-Moment Correlation. Findings indicated that poor storage facilities (Mean = 4.32), high humidity (Mean = 4.21), pest infestation (Mean = 4.05), and prolonged storage duration (Mean = 3.88) were the major factors contributing to seed deterioration. Economic losses associated with deterioration were reported as reduced germination rates, lower market value, increased replacement costs, and reduced profitability. Correlation analysis revealed a significant positive relationship between storage quality and economic performance ($r = 0.62$; $p < 0.05$). The study concludes that investments in improved storage infrastructure, capacity building, and seed quality monitoring systems can significantly reduce deterioration-related losses and enhance value-chain efficiency. The paper recommends greater adoption of modern storage technologies and strengthened extension support services to improve seed longevity and profitability.

Keywords: Seed storage, Seed deterioration, Seed longevity, Agricultural economics, Value chain efficiency, Nigeria.

Introduction

Seed is the most fundamental input in agricultural production, determining the effectiveness of all other inputs, including fertilizers, irrigation, agrochemicals, and mechanization. The productivity and sustainability of crop production systems depend largely on the availability of high-quality seed capable of maintaining viability and vigor throughout storage and distribution. Consequently, seed storage has become a strategic component of agricultural development, food security, and genetic resource conservation worldwide. Recent advances in seed science and technology have highlighted the importance of storage conditions, seed longevity, and deterioration processes in preserving seed quality and maximizing agricultural productivity (Crossa *et al*., 2017; Taylor *et al*., 2021).

Seed longevity refers to the ability of seeds to maintain viability and vigor during storage, while seed deterioration describes the irreversible physiological and biochemical changes that progressively reduce seed quality over time. Research has shown that temperature, relative humidity, seed moisture content, storage duration, packaging materials, and pest infestation significantly influence seed longevity and deterioration (Hay *et al*., 2020; Nagel & Börner, 2021; Rajjou *et al*., 2022).

The economic implications of seed deterioration are substantial. Deterioration reduces germination rates, lowers market value, increases replacement costs, and ultimately diminishes agricultural productivity. These losses affect farmers, seed producers, marketers, and other actors within the seed value chain. In tropical countries such as Nigeria, where seeds are often stored under ambient conditions, high temperatures and humidity accelerate seed ageing and contribute to significant post-harvest losses.

The persistent deterioration of seeds during storage remains a major but insufficiently quantified economic challenge in Nigeria. Inadequate storage facilities, poor handling practices, high temperatures, humidity, and pest infestations contribute to declining seed quality before seeds reach end users. The resulting losses include reduced viability, lower germination rates, decreased market value, and increased production costs. However, empirical evidence regarding the economic impacts of these losses and the role of storage conditions in determining profitability remains limited. Despite growing attention to the biological aspects of seed deterioration, limited empirical studies have examined its economic implications within Nigeria's seed sector. This information gap hinders the formulation of effective policies and investments aimed at improving seed storage systems and strengthening agricultural value chains. Understanding the economic consequences of storage practices is essential for developing effective interventions that improve seed quality, reduce losses, and enhance agricultural productivity.

Consequently, the broad objective of this study was to examine the economics of seed storage, deterioration, and longevity among agricultural stakeholders in Oke-Ogun, Oyo State, Nigeria. Specifically, the study sought to, first, determine stakeholders' perceptions of factors influencing seed deterioration and longevity during storage. Two, examine the relationship between storage conditions and the economic performance of stored seeds.

Research Hypothesis

H_{01}: There is no significant relationship between storage conditions and the economic performance of stored seeds.

Research Methodology

A cross-sectional survey design was adopted for the study. The study area was Oke-Ogun, Oyo State. A total of 100 respondents were selected using multistage sampling: farmers (60), seed marketers (20), agro-dealers (10) and extension/seed-sector stakeholders (10).

Table 1. Distribution of Respondents

Category	Frequency	Percentage
Farmers	60	60.0
Seed marketers	20	20.0
Agro-dealers	10	10.0
Extension stakeholders	10	10.0
Total	**100**	**100.0**

Table 1 shows the distribution of respondents by stakeholder category within the seed value chain in Oke-Ogun, Oyo State. Farmers constituted the largest group of respondents, accounting for 60 **(60.0%)** of the total sample. This indicates that the study was predominantly represented by primary agricultural producers, whose experiences and perceptions are particularly important for understanding agricultural production and productivity challenges. Seed marketers comprised 20 respondents (20.0%), reflecting the inclusion of stakeholders involved in the distribution and marketing of improved seeds and other planting materials. Agro-dealers accounted for 10 respondents (10.0%) and represent actors involved in supplying agricultural inputs such as fertilizers, pesticides, seeds, and related farm materials. The remaining 10 respondents (10.0%) were extension stakeholders, whose inclusion provides perspectives on agricultural advisory services, technology dissemination, farmer training, and the transfer of improved production practices.

Data Analysis

Descriptive statistics including frequencies, percentages, means, and rankings were used to summarize data. Pearson Product-Moment Correlation was employed to test the relationship between storage quality and

economic performance at a 5% level of significance.

The Pearson Product-Moment Correlation Coefficient (r) was calculated using the following formula:

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{n[\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}}$$

Where:

- r = Pearson correlation coefficient
- n = Number of respondents ($n = 100$)
- X = Storage quality scores (independent variable)
- Y = Economic performance scores (dependent variable)
- $\sum XY$ = Sum of the products of paired scores
- $\sum X$ = Sum of X scores
- $\sum Y$ = Sum of Y scores
- $\sum X^2$ = Sum of squared X scores
- $\sum Y^2$= Sum of squared Y scores

Results and Discussion

Table 2. Perceived Factors Influencing Seed Deterioration Variable Mean Score Rank

Variable	Mean Score	Rank
Poor storage facilities	4.32	1st
High humidity	4.21	2nd
Pest infestation	4.05	3rd
Long storage duration	3.88	4th

Table 2 shows respondents' perceptions of the major factors responsible for seed deterioration during storage.

Results show that inadequate storage facilities constitute the most important factor contributing to seed deterioration. High humidity and pest infestation were also identified as major causes of quality loss. These findings are consistent with previous studies highlighting the importance of environmental conditions in maintaining seed viability (Hay *et al*., 2020; Rajjou *et al*., 2022).

Table 3. Correlation Analysis

Variables	r-value	p-value	Decision
Storage quality and economic performance	0.62	0.001	Significant

Table 3 presents the Pearson-Product Moment Correlation analysis examining the relationship between storage quality and economic performance.

The result reveals a positive and significant relationship between storage quality and economic performance. This suggests that stakeholders who utilize improved storage systems experience lower deterioration losses and higher economic returns. The finding supports the post-harvest economics framework, which emphasizes the role of storage investments in enhancing profitability and value-chain efficiency.

Conclusion

Seed deterioration remains a significant biological and economic challenge among agricultural stakeholders in Oke-Ogun, Oyo State. Poor storage facilities, high humidity, pest infestation, and prolonged storage duration were identified as major factors accelerating deterioration. The study further established a significant positive relationship between storage quality and economic performance. Improving storage infrastructure and management practices can therefore reduce losses, enhance seed longevity, and improve profitability across the seed value chain.

Recommendations

Based on the findings of the study the following recommendations were made:

1. Farmers and seed marketers adopt improved storage technologies capable of controlling temperature and humidity.
2. Government and development agencies invest in community-based seed storage facilities.
3. Extension services intensify training on seed handling and storage management.

4. Seed quality monitoring and certification systems be strengthened.
5. Affordable credit facilities be provided to support investments in improved storage infrastructure.

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