

Study of Feedstuff Weight Loss During Storage

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Extended Abstract

Introduction: Storage of agricultural products is essential for ensuring food security, market stability, and price regulation. In Iran, the primary livestock feedstuffs—corn, barley, and soybean meal—are either domestically produced or imported to meet the high demand from livestock farms and poultry industries. However, during storage, these feedstuffs experience weight loss due to multiple factors, including the type of storage facility (silo, warehouse, open storage), environmental conditions, and storage duration. The estimation of weight loss is crucial for warehouse managers and feedstuff owners to manage inventory efficiently and minimize economic losses. This study evaluates the weight loss of corn, barley, and soybean meal based on different storage conditions and climatic factors across Iran using data from 2015 to 2023.

Methods: This study analyzed data from 31 provinces across Iran, incorporating various climatic conditions and storage durations (3, 6, 9, and 12 months or more). The dataset was collected from the State Livestock Affairs Logistics (S.L.A.L) Inc. and examined weight loss variations in different storage types (silo, warehouse, open storage). The independent variables included storage type, duration, and climate, while the dependent variable was the weight loss of feedstuffs. Statistical analysis was conducted using SPSS software, and mean comparisons were performed using ANOVA models:

Model 1 for corn and barley:

$$Y_{ijkl} = \mu + S_i + T_j + C_k + \varepsilon_{ijkl}$$

Model 2 for soybean meal:

$$Y_{ijk} = \mu + T_i + C_j + \epsilon_{ijk}$$

Where Y_{ijk} represents weight loss (kg per ton), μ is the overall mean, T_i is the storage type effect, C_j is the storage duration effect, C_j is the climate effect, and ϵ_{ijk} is the error term.

Results and Discussion: The study found significant differences in weight loss across different storage conditions and climates ($P < 0.01$). The highest weight loss occurred in silos, while the lowest was observed in open storage. This could be attributed to the ventilation and aeration systems in silos, which facilitate moisture evaporation, leading to weight reduction. Warehouses exhibited intermediate weight loss values, likely due to moderate environmental exposure and better protection compared to open storage. Weight loss increased with storage duration, with the highest losses recorded for feedstuffs stored for 12 months or longer. The initial three-month period showed significant weight reduction, particularly for corn, due to moisture evaporation after importation and transportation. Soybean meal showed the most significant weight loss in hot and dry climates, followed by hot and humid conditions. The lowest weight loss was recorded in rainy regions, where humidity levels may contribute to reduced dehydration. Corn and barley stored in cold regions exhibited moderate weight loss compared to those in hot and dry climates. Handling and processing activities, such as loading, unloading, and aeration, contributed to additional weight loss. Differences in calibration of weighing systems and environmental exposure during transport also played a role in observed variations. These findings highlight the importance of optimizing storage management strategies to mitigate weight loss. Proper selection of storage facilities and climate-aware management techniques can significantly reduce economic losses for livestock feedstuff suppliers.

Conclusion: The study underscores the importance of effective storage management in minimizing feedstuff weight loss. The selection of appropriate storage types, reduction of prolonged storage durations, and adaptation to regional climatic conditions can help mitigate weight loss and associated financial losses. Future research should explore innovative storage technologies, such as controlled-atmosphere storage and improved aeration techniques, to further enhance feedstuff preservation. By implementing these strategies, stakeholders in the livestock industry can enhance inventory efficiency and maintain the nutritional quality of stored feedstuffs.

Keywords: Feedstuffs, Weight loss, Storage