Minimizing Shrink Loss in Potatoes in Storage
Year 1 Report

The core objective of this research is to provide practical strategies for minimizing shrink loss in stored potatoes while maintaining the optimal quality required by processors.

Shrink loss is a natural process driven by two primary factors:

1. **Respiration**, where the living tubers consume oxygen and release heat, moisture, and CO2
2. **Evaporation**, which is influenced by the temperature and relative humidity of the storage environment.

Evaporation is the dominant factor, responsible for approximately 90% of total moisture loss in stored tubers.

Our study was designed to measure the impact of these factors in real-world commercial storage facilities to understand where and why losses are occurring.

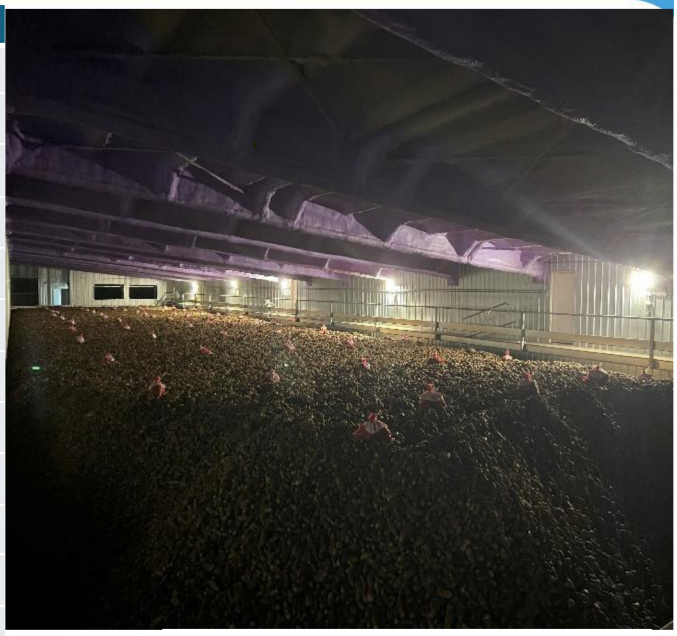
On-Farm Study Design
To gather data that reflects actual conditions on farms, we conducted trials directly within large-scale commercial storage bins. This on-farm approach ensures our findings are relevant and immediately applicable.

The study was structured as follows:

- **Scale**: The project currently includes 4 participating farms and 6 different storage bins across Southern Alberta.
- **Sampling Method:** Two hundred 20 lb. mesh bags of potatoes were pre-weighed and placed into the piles as the bins were being filled. This allowed precise tracking of weight loss over time.
- **Placement Strategy:** Bags were placed at three different depths within the piles: Top, Middle, and Bottom. They were also distributed from the beginning to the end of each bin.
- **Monitoring Process:** The accessible samples on the top of the pile were weighed bi-weekly and key storage conditions were monitored, including temperature, relative humidity (RH), and CO2 levels, to correlate environmental factors with weight loss.

Spatial Sampling Location in the Storage Bin

Spatial sampling locations				
L1_1	L2_1	L3_1	L4_1	L5_1
L1_2	L2_2	L3_2	L4_2	L5_2
L1_3	L2_3	L3_3	L4_3	L5_3
L1_4	L2_4	L3_4	L4_4	L5_4
L1_5	L2_5	L3_5	L4_5	L5_5
L1_6	L2_6	L3_6	L4_6	L5_6
L1_7	L2_7	L3_7	L4_7	L5_7
L1_8	L2_8	L3_8	L4_8	L5_8
L1_9	L2_9	L3_9	L4_9	L5_9
L1_10	L2_10	L3_10	L4_10	L5_10
L1_11	L2_11	L3_11	L4_11	L5_11
L1_12	L2_12	L3_12	L4_12	L5_12



What the Data Tells Us About Shrink Loss

This information represents a real-world snapshot of shrink loss dynamics during a typical storage season.

Finding 1:

Horizontal Location (Front vs. Back) is Not a Major Driver of Shrink Loss

The analysis of samples placed at the top of the piles, comparing those at the beginning, middle, and end of the bins, found that location did not have a statistically significant overall effect on shrinkage.

- A trend was observed: the middle sections of the piles often experienced the most stable conditions and, consequently, slightly lower weight loss. This reinforces the value of achieving uniform environmental control throughout the entire storage structure.

Finding 2:

Vertical Location (Pile Depth) is a critical factor in Shrink Loss.

When comparing samples from the Top, Middle, and Bottom depths, a clear pattern emerged: samples located at the bottom of the piles consistently exhibited greater shrinkage than those at the middle and top levels, highlighting this as a key area for management focus.

This difference is most likely attributed to increased airflow rates near the plenum and through the base of the pile. While essential for temperature and gas management, excessive or poorly managed airflow at the bottom can accelerate moisture loss from the tubers in that zone.

Finding 3:

Impact on Potato Quality Varies

The effect of storage location on final potato quality showed mixed results, depending on the parameter being measured.

- Dry Matter and Specific Gravity: the depth of the sample within the pile did not have a significant effect
- Glucose and Sucrose: The results for sugar content were more variable. The final glucose and sucrose levels appear to depend heavily on the specific storage conditions in the weeks just before unloading.

Finding 4:

Overall Shrink Loss Benchmark

To provide a practical benchmark for Alberta producers, we calculated the average total shrinkage observed in the study. After 38 weeks of storage, the average shrinkage of samples placed at the top of the pile across all participating farms ranged from 3.94% to 7.54%.

This project is currently being conducted by Dr. Chandra Singh and his team at the Lethbridge Polytechnic. Further work will be added to the website once the project is complete.