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Storage System Validation Study for Raw Cocoa Beans Using Minitab® 17 and R (R-3.3.1)

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Abstract : In this observational study, the performance of a known conventional storage system was tested and evaluated for fitness for its intended purpose. The system has a scope extended for the storage of dry cocoa beans. System sensitivity, reproducibility and uncertainties are not known in details. This study discusses the system performance in the context of existing literature on factors that influence the quality of cocoa beans during storage. Controlled conditions were defined precisely for the system to give reliable base line within specific established procedures. Minitab® 17 and R statistical software (R-3.3.1) were used for the statistical analyses. The approach to the storage system testing was to observe and compare through laboratory test methods the quality of the cocoa beans samples before and after storage. The samples were kept in Kilner jars and the temperature of the storage environment controlled and monitored over a period of 408 days. Standard test methods use in international trade of cocoa such as the cut test analysis, moisture determination with Aqua boy KAM III model and bean count determination were used for quality assessment. The data analysis assumed the entire population as a sample in order to establish a reliable baseline to the data collected. The study concluded a statistically significant mean value at 95% Confidence Interval (CI) for the performance data analysed before and after storage for all variables observed. Correlational graphs showed a strong positive correlation for all variables investigated with the exception of All Other Defect (AOD). The weak relationship between the before and after data for AOD had an explained variability of 51.8% with the unexplained variability attributable to the uncontrolled condition of hidden infestation before storage. The current study concluded with a high-performance criterion for the storage system.

Keywords : benchmarking performance data, cocoa beans, hidden infestation, storage system validation
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