
Chapter 3 – Research Method

Research Ethics and Operational Permission

This study was conducted within the hotel property where the researcher is currently employed as a culinary professional. Prior to data collection, verbal approval was obtained from the General Manager regarding the use of operational kitchen data for academic research purposes. All operational data presented in this study are reported in aggregated and anonymized form to protect the commercial confidentiality of the property. No guest personal data were collected at any point during this research. The study did not involve human subjects in an experimental capacity, the data collection was limited to the measurement and recording of food waste quantities generated during normal kitchen operations.

3.1 Research Design

This study adopts a quantitative two-phase implementation design, structured around the introduction and progressive application of a data-driven food waste tracking protocol within a five-star hotel kitchen environment in Jakarta, Indonesia. The research design draws upon the Plan-Do-Check-Act (PDCA) cycle as its operational framework (Shi, 2024), wherein the fourteen-day observation period is divided into two analytically distinct phases that reflect different stages of protocol adoption.

Prior to the commencement of the formal observation period, a structured Baseline Observational Day was conducted on Day 0. This session served three critical methodological functions within the Operations Management framework adopted in this study (Heizer, Render & Munson, 2020): (1) establishing a documented operational reference point against which subsequent protocol-driven observations could be contextually compared; (2) calibrating the food waste tracking instrument within the live kitchen environment through a pilot recording session reviewed and validated by the Executive Chef; and (3) identifying and resolving any ambiguities in waste categorization procedures prior to formal data collection.

During Day 0, kitchen operations proceeded under normal conditions without any staff behavioral modification or tracking-related awareness. Food waste was measured and recorded using the same standardized instrument and digital scale employed throughout the subsequent fourteen-day formal observation period. The resulting Day 0 data, while not included in the inferential statistical analysis due to its pilot nature, provides an operational context reference

that substantiates the transitional trajectory observed between the Pretest Phase (Days 1-7) and the Posttest Phase (Days 8-14).

This design structure comprising a Baseline Day (Day 0), an Early Adoption Phase (Days 1-7), and a Stabilized Implementation Phase (Days 8-14) is consistent with short-term implementation research frameworks in operations management, where a documented pre-intervention reference point strengthens the interpretive validity of phase-comparative findings (Heizer et al., 2020; Shi, 2024).

The Pretest Phase encompasses the first seven days of observation (Days 1 through 7). During this period, the food waste tracking instrument was introduced to kitchen operational staff, and recording procedures were initiated under conditions of active staff familiarization. As the tracking protocol represented a new operational practice within the hotel environment, the initial phase is characterized by a transitional recording condition in which staff compliance and measurement consistency were still developing. Data collected during this phase therefore represent food waste generation under conditions of early-stage protocol adoption, prior to the full stabilization of tracking procedures.

The Posttest Phase covers the subsequent seven days of observation (Days 8 through 14). By this stage, kitchen staff had developed sufficient familiarity with the tracking instrument and recording requirements to apply the protocol with greater consistency and accuracy. The posttest phase therefore represents food waste generation under conditions of established protocol implementation, wherein the tracking system was functioning as an integrated component of daily kitchen operations rather than as an unfamiliar procedural addition.

This two-phase structure enables a comparative analysis of food waste patterns between the early adoption period and the stabilized implementation period, providing preliminary evidence regarding the operational impact of structured waste monitoring on kitchen behavior and waste generation outcomes. The design is consistent with short-term implementation studies in food service research, where observable behavioral and operational shifts have been documented within condensed observation windows following the introduction of structured management protocols (Sigala et al., 2025)

3.2 Data Collection Methods

This study utilizes primary data collected directly from hotel food service operations in a five-star hotel located in Jakarta. The data collection process focuses on real kitchen food waste data, ensuring a high level of accuracy and reliability in measuring operational performance.

Step 1 : Preparation (Day 0): Tracking sheet reviewed by Executive Chef, pilot recording session conducted, digital scale calibrated.

Step 2 : Pretest Phase (Days 1-7): Protocol introduced, staff in familiarization mode, data recorded daily by waste type, section, meal period, quantity in grams.

Step 3 : Posttest Phase (Days 8-14): Protocol fully adopted, recording consistent and stable, same variables tracked.

Step 4 : Data Compilation: All 14 days compiled in Microsoft Excel, variables computed is Waste per Cover, Waste %, Operational Efficiency.

Step 5 : Statistical Analysis (Jamovi v2.3): Descriptive statistics → Paired T-Test → Pearson Correlation.

The research applies a direct measurement and observation method, where food waste is systematically recorded during daily kitchen operations over a two-week period. This approach allows the researcher to capture actual waste generation patterns under normal operational conditions. The main instrument used in this study is a food waste tracking sheet, designed to record key variables such as:

1. Type of food waste (e.g., preparation waste, plate waste, spoilage)
2. Quantity of waste (measured in kilograms)
3. Source of waste (kitchen section or production stage)
4. Time of occurrence (meal period: breakfast, lunch, dinner)

The data collection procedure involves:

- a) Weighing food waste using a digital kitchen scale immediately after disposal
- b) Recording data manually or digitally into a structured tracking form
- c) Categorizing waste based on predefined classifications

d) Monitoring daily trends to identify patterns of waste generation

Waste Kitchen Production Data Sheet												
Date	Day	Meal Period	Section	Food Type	Waste Type	Waste (gr)	Covers	Production Qty (kg)	Remarks	Waste per Cover	Waste %	Efficiency Indicator
1 march 2026	Sun	Breakfast	Buffet	variant guest consumed	Plate Waste	1200	180	90	Guest Leftover	6,67	13,33	0,08
2 march 2026	Mon	Lunch	Main Kitchen	Prep sautee vegetable	Prep Waste	900	50	25	Vegetable trimming	18,00	36,00	0,03
3 march 2026	Tue	Dinner	Main Kitchen	Fish Menu	Spoilage	500	30	15	Over production	16,67	33,33	0,03
4 march 2026	Wed	Breakfast	Buffet	variant guest consumed	Plate Waste	1100	210	105	Guest Leftover	5,24	10,48	0,10
5 march 2026	Thu	Lunch	Buffet	Prep stir fry vegetable	Prep Waste	300	70	35	Vegetable peeling	4,29	8,57	0,12
6 march 2026	Fri	Dinner	Banquet	Egg menu	Spoilage	250	30	15	Over production	8,33	16,67	0,06
7 march 2026	Sat	Breakfast	Buffet	variant guest consumed	Plate Waste	1100	150	75	Guest Leftover	7,33	14,67	0,07
8 march 2026	Sun	Lunch	Main Kitchen	Prep Salad	Prep Waste	500	60	30	Vegetable trimming	8,33	16,67	0,06
9 march 2026	Mon	Dinner	Buffet	Fish Menu	Spoilage	200	50	25	Over production	4,00	8,00	0,13
10 march 2026	Tue	Breakfast	Banquet	variant guest consumed	Plate Waste	1300	220	110	Guest Leftover	5,91	11,82	0,08
11 march 2026	Wed	Lunch	Banquet	Condiment for veg soup	Prep Waste	300	40	20	vegetable peeling	7,50	15,00	0,07
12 march 2026	Thu	Dinner	Main Kitchen	Fish Menu	Spoilage	200	30	15	Over production	6,67	13,33	0,08
13 march 2026	Fri	Breakfast	Main Kitchen	variant guest consumed	Plate Waste	1100	250	125	Guest Leftover	4,40	8,80	0,11
14 march 2026	Sat	Lunch	Main Kitchen	Prep Sushi	Prep Waste	500	70	35	Vegetable trimming	7,14	14,29	0,07

Table 3.2-1 Table waste kitchen production data sheet sampling

To ensure data consistency, all measurements are conducted using the same equipment and standardized procedures throughout the data collection period. This method enables the study to generate quantifiable and objective data, which is essential for analyzing the effectiveness of data-driven tracking systems in reducing controllable food waste. The data collection approach follows a structured waste audit method commonly applied in hospitality food waste studies.

Instrument Validity and Reliability

The food waste tracking sheet used in this study was developed based on established food waste audit frameworks applied in hospitality research. Prior to formal data collection, the tracking sheet was reviewed by the Executive Chef to ensure that all waste categories and recording fields accurately reflected the operational realities of the kitchen environment. A one day pilot recording session was conducted on day 0 to identify any ambiguities in the recording procedure and to verify that all measurement categories were clearly understood by the staff involved in data collection. Any unclear items were clarified before the formal observation period commenced. The use of a single calibrated digital weighing scale throughout the entire observation period further ensured measurement consistency, minimizing variability between recording sessions. This approach to instrument reliability is consistent with direct

measurement methods recommended for food waste quantification in food service environments (Tomaszewska et al., 2021)(Sigala et al., 2025).

3.3 Data Analysis Technique

3.3.1 Pretest and Posttest Data Analysis Tools

The analytical approach of this study integrates two complementary methodological dimensions that are aligned with the Operational Management Efficiency framework (Geminarqi & Purnomo, 2023): an observational-experimental dimension and a quantitative-statistical dimension. The experimental-observational dimension encompasses the direct physical measurement of food waste quantities across fifteen operational days (Day 0 through Day 14) using a calibrated digital scale, categorized by waste type, kitchen section, and meal period. The quantitative-statistical dimension translates raw observational data into statistically interpretable evidence of operational change through three sequential analytical stages. Together, these two dimensions ensure that every empirical claim in Chapter 4 is grounded in both direct measurement evidence and statistical verification fulfilling the evidence-based decision-making requirement central to the Operational Management Efficiency framework. Data analysis in this study is structured around two complementary analytical approaches, applied sequentially to address the research hypotheses and fulfill the comparative objectives of the two-phase research design.

Stage 1 : Descriptive Statistics

Descriptive statistical analysis was applied to both the pretest dataset (Days 1–7) and the posttest dataset (Days 8–14) to summarize the central tendencies, dispersion, and distributional characteristics of key operational variables. Measures reported include the mean, standard deviation, minimum value, maximum value, and range for food waste quantity, waste per cover ratio, waste percentage, production quantity, number of covers, and operational efficiency indicators. Descriptive analysis was conducted separately for each phase to enable direct numerical comparison between pretest and posttest conditions, providing an accessible overview of observable shifts in waste generation patterns across the two measurement periods.

Stage 2 : Paired Sample T-Test

To assess whether statistically significant differences existed between pretest and posttest observations across the key waste indicators, a Paired Sample T-Test was conducted using Jamovi (version 2.3). The Paired Sample T-Test is appropriate for this design because both phases were observed within the same operational environment, involving the same kitchen staff, service conditions, and production infrastructure differing only in the degree of tracking protocol familiarity and implementation consistency. This within-subject design controls for environmental variability and isolates the effect of protocol adoption on recorded waste outcomes. Significance was evaluated at a confidence level of 95% ($\alpha = 0.05$). A statistically significant result ($p < 0.05$) would indicate a meaningful difference in waste behavior between the two phases, providing empirical support for the corresponding alternative hypothesis.

Stage 3 : Pearson Correlation Analysis

Pearson correlation analysis was applied to the full fourteen-day dataset to examine the strength and direction of linear relationships between food waste quantity and key operational predictors, including number of covers, production quantity, and efficiency indicators. This analysis addresses Hypothesis 2 and provides contextual understanding of the operational drivers that influence waste generation across the complete observation period. Correlation coefficients were interpreted using standard threshold values: r values between 0.70 and 1.00 indicating strong relationships, 0.40 to 0.69 indicating moderate relationships, and below 0.40 indicating weak relationships. All statistical analyses were performed using Jamovi (version 2.3), an open-source statistical software platform that applies the same analytical algorithms as IBM SPSS Statistics and produces equivalent outputs for paired sample t-test and Pearson correlation procedures.

3.4 Operational Variables

This section defines the operational variables examined in this study and specifies the instruments employed for data collection and quantitative analysis. Operational variables are classified according to their functional role within the research model established in Section 2.5, encompassing independent, mediating, and dependent variable categories. Clear

operationalization of each variable ensures measurement consistency throughout the data collection process and supports the validity of the statistical analyses conducted in Chapter 4.

Variable	Type	Operational Definition	Measurement Unit	Data Collection Phase
Data-Driven Tracking Protocol	Independent	Structured daily recording system for food waste measurement, categorized by waste type, source, meal period, and production section	Protocol implementation documented via standardized tracking sheets	Pretest & Posttest
Food Waste Quantity	Dependent	Total measurable controllable waste recorded per daily observation session, excluding unavoidable preparation waste such as bones and inedible trimmings	Grams (g)	Pretest & Posttest
Waste Per Cover	Dependent	Daily food waste volume divided by the total number of guests served during the corresponding observation period	Grams per cover (g/cover)	Pretest & Posttest
Waste Percentage	Dependent	Ratio of recorded food waste quantity relative to total daily production output, expressed as a proportion	Percentage (%)	Pretest & Posttest
Number of Covers	Independent	Total number of guests served across all meal periods within each daily observation session	Count (persons)	Pretest & Posttest
Production Quantity	Independent	Total volume of food prepared across all kitchen sections during each daily observation session	Kilograms (kg)	Pretest & Posttest
Operational Efficiency	Mediating	Calculated as the ratio of net utilized production total production minus recorded waste relative to total daily production output, expressed as a percentage	Percentage (%)	Pretest & Posttest

Table 3.4-1 Operational Variables

Operational efficiency was computed using the following formula applied across all fourteen observation days:

Operational Efficiency (%) = $((\text{Production Quantity} \times 1000) - \text{Waste Quantity}) \div (\text{Production Quantity} \times 1000) \times 100$. The conversion factor of 1,000 was applied to normalize production quantity values from kilograms to grams, ensuring unit consistency with waste quantity measurements recorded in grams. This calculation method produces an efficiency index that reflects the proportion of total production output successfully utilized during each observation session, with higher values indicating lower proportional waste generation relative to production volume.

It is acknowledged that efficiency values approaching 100% reflect the proportional relationship between targeted controllable waste recording and total kitchen production output. As waste recording focused on specific controllable waste categories rather than a comprehensive whole-kitchen audit, the resulting efficiency figures indicate the degree of production utilization within the scope of the tracking protocol rather than an absolute measure of kitchen-wide resource efficiency. This measurement approach is intentional and consistent with the study's analytical focus on controllable waste streams as defined in Chapter 1.

Research Instruments

The primary data collection instrument used in this study was a standardized food waste tracking sheet, developed specifically for the operational context of the selected hotel kitchen environment. The tracking sheet was designed to capture daily records of food waste quantity, waste category, production source, and meal period across both the pretest and posttest observation phases.

Prior to formal data collection, the instrument was reviewed by the Executive Chef to verify that all waste categories and recording fields accurately reflected the kitchen's operational structure. A one-day pilot recording session was conducted on Day 0 to identify ambiguities in the recording procedure and ensure measurement categories were clearly understood by all staff involved in data collection.

Supporting instruments included a single calibrated digital kitchen weighing scale used consistently throughout the fourteen-day observation period to minimize measurement variability, and Microsoft Excel for initial data organization and variable computation. All inferential statistical analyses including descriptive statistics, Paired Sample T-Test, and Pearson correlation were performed using Jamovi (version 2.3), an open-source statistical analysis platform that applies equivalent analytical algorithms to IBM SPSS Statistics and produces comparable outputs for all procedures employed in this study.

Chapter 4 – Result and Discussion

4.1 Company Overview

This chapter presents the findings and discussion derived from the implementation of the data driven food waste tracking protocol within the selected hotel food service operation. The analysis focuses on the operational characteristics of the hotel, the structure of its food and beverage department, and the actual food waste data collected during the research period. The purpose of this chapter is to evaluate how the implementation of structured waste monitoring contributes to improving operational efficiency and reducing controllable food waste in hotel kitchen operations.

The study was conducted in a five star business hotel located in Jakarta City Indonesia. The property operates as a full-service hotel that provides accommodation, food and beverages services, banquet facilities and meeting spaces for both leisure and corporate guests. As one of the hotels that operating in highly competitive hospitality environment, the property maintains high service standards, particularly in food production and guest dining experiences. The hotel serves a large number of guests daily through multiple food service outlets and banquet operations, which creates a complex food production environment with a significant potential for food waste generation.

The hotel's Food and Beverage Departments plays an important role in supporting overall hotel revenue and guest satisfaction. The department consists of several operational divisions, including restaurant services, banquet operations, kitchen production, stewarding and room service. Daily food production activities involve coordination between kitchen staff, service