Responsible Production Practices to Minimize Food Waste in Aviation Catering: A Case Study at Newrest Arlanda

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Declaration

We declare this thesis is our own and has not been submitted for any other degree or qualification at this or any other university. All information derived from the published and unpublished work of others has been acknowledged in the text, and a list of references is provided in the bibliography.

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Abstract

This study investigates how production practices within aviation catering generate food waste and explores how responsible production can be strengthened within the regulatory and operational constraints of the sector. Focusing on Newrest Arlanda as a single qualitative case study, the research addresses two central questions: *(RQ1) How do current production practices and routines contribute to food waste?* and *(RQ2) How can responsible production practices be improved to minimise food waste?* Data were collected through eight semi-structured interviews, including two face-to-face conversations and six written-response interviews across management, supervisory, and frontline roles. The findings reveal that food waste is structurally produced rather than the result of individual behaviour. Key drivers include forecasting buffers, rigid portioning and tray standards, departmental fragmentation across hot kitchen, cold kitchen, assembly, and dispatch, and aviation-specific food-safety regulations that classify most returned or compromised food as Category 1 waste. Data limitations further hinder organisational learning, as waste records function largely as compliance tools rather than mechanisms for improvement. These findings align with global food-service research showing that operational uncertainty, risk aversion, and regulatory pressure intensify overproduction and limit opportunities for reuse or redistribution. In response to RQ2, participants identified realistic opportunities to enhance responsible production. These include redesigning menus to be more modular, improving forecasting logic, strengthening communication between departments, and fostering leaner flows with clearer feedback loops. Staff also emphasised the need for better engagement, training, and recognition to build ownership of waste-reduction initiatives. At an institutional level, participants highlighted the importance of collaboration with airlines, airport authorities, and regulators to re-examine safety margins, contractual specifications, and opportunities for circular-economy solutions. Overall, the study proposes that meaningful waste reduction requires both internal operational improvements and broader institutional cooperation. It contributes to the limited literature on airline catering waste by integrating institutional theory and lean thinking to explain why waste persists and how responsibility can be embedded earlier in production design.

Keywords: food waste, aviation catering, responsible production, institutional theory, lean operations, circular economy

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1. Introduction

Aviation catering is one of the most overlooked yet most waste-intensive food production environments globally. This chapter introduces the context, relevance, and research problem underlying responsible production for waste minimization in airline catering, establishing the foundation, motivation, and research direction of this thesis.

1.1 Background

The global food system is facing unprecedented sustainability challenges, where food waste has emerged as one of the most critical and complex issues affecting economic stability, environmental resilience, and social justice. According to the United Nations Environment Programme (2023), over 1.05 billion tonnes of food are wasted globally every year, representing nearly 20% of food available to consumers. This inefficiency results in a measurable loss of agricultural inputs, water, land, energy, transportation resources, and labour investments embedded across the supply chain (FAO, 2022). As food production and consumption intensify with the growing world population, food waste increasingly undermines the achievement of global sustainability commitments—particularly the United Nations Sustainable Development Goal (SDG) 12 which aims to ensure sustainable production and consumption patterns, and specifically Target 12.3 which calls for halving global food waste by 2030. The urgency of this target is further amplified by the fact that wasted food, when disposed into landfills, contributes to methane emissions—a greenhouse gas 28 times more potent than carbon dioxide (IPCC, 2022). Consequently, international organizations, governments, researchers, and industries are increasingly pressed to identify practical, operational, and structurally embedded causes of food waste and build pathways to reduce it at scale.

Food waste is produced at different stages of the food supply chain—from pre-harvest and post-harvest storage to retail distribution, food service operations, and consumer homes. However, existing literature shows that a significant proportion of waste in institutional food production originates before reaching the end consumer, particularly in professionally managed, large-scale, high-volume catering environments (Papargyropoulou et al., 2019; Xue et al., 2017). Unlike households or retail settings where consumers make behavioural choices, institutional catering systems operate with standardized processes, regulated safety regimes, and production-focused

operational planning which reduces consumer influence on waste outcomes. This characteristic makes institutional food service environments strategically important for waste reduction interventions, because prevention at the production stage can result in significant upstream environmental and economic benefits (Filimonau & De Coteau, 2019). Reducing waste earlier in the supply chain also prevents additional resource expenditure from being locked into meals that eventually go uneaten.

Among institutional food service settings, aviation catering has been consistently identified as one of the most unique, resource intensive, risk-controlled and structurally complex sectors of food production (Chen & Hidalgo, 2021). Airlines and their catering suppliers produce thousands of pre-portioned meals daily under strict time constraints, highly standardized service protocols, and operational uncertainty driven by unpredictable passenger demand, last-minute booking fluctuations, route changes, supply chain disruptions, staffing limitations, and flight delays (Ross, 2014; Mirosa et al., 2023). The food produced must be compliant with stringent hygiene and biosecurity requirements due to the global movement of aircraft and passengers across borders. As a result, aviation catering operations are frequently required to adopt risk-averse strategies, such as preparing extra meals intentionally, to avoid shortages on board. This operational reality often leads to systematic overproduction and pre-consumer food waste. Previous academic studies have highlighted that most food waste within aviation catering occurs before departure, during storage, preparation, cooking, portioning, assembly, and pre-loading stages, rather than in post-consumption passenger behaviour or plate waste (Hennchen, 2019; Chen & Hidalgo, 2021). Therefore, aviation catering presents a very distinct context where production decisions are the primary determinants of food waste, making responsible production practices central to addressing the problem.

Although aviation catering has been examined in prior studies, the existing body of work is uneven in *where* it locates the waste problem and *how* it explains it. Much aviation-related research has concentrated on cabin waste volumes, passenger-side consumption and plate waste, or post-flight waste streams, often treating the issue as an extension of hospitality foodservice behaviour and downstream disposal (You et al., 2020; You, 2022; IATA, 2023). In contrast, fewer studies examine the production-stage decision architecture inside catering facilities—how buffer rules are set, how forecasting uncertainty is translated into batch sizes, and how compliance and airline

specifications shape "acceptable" surplus before meals ever reach the aircraft (Akkerman et al., 2010; Chen & Hidalgo, 2021). This thesis therefore does not revisit aviation catering simply as another "wasteful sector," but repositions it as an *institutionally constrained production system* where waste is produced through rationalised operational decisions under coercive regulation. The unit of analysis is shifted from describing waste outcomes to explaining the production decision logics that generate waste and define the realistic boundaries of responsible production interventions at the source.

The aviation sector's regulatory environment further differentiates it from other hospitality service contexts. Under European Commission Regulation (EC) No. 1069/2009, food waste originating from international aircraft arriving into the European Union is categorised as Category 1 high-risk waste, which legally must be destroyed through incineration or deep landfill disposal due to biosecurity protection requirements (European Commission, 2024). This means that unused food from flights cannot be redistributed to charities, composted, recycled, or repurposed for animal feed—even when meals are still fully sealed, edible and intact. As a result, the aviation catering sector is largely restricted from engaging in downstream circular economy interventions commonly used in retail, restaurants, or healthcare food service. This regulatory constraint shifts the focus of food waste intervention from post-consumption recovery to pre-consumption production optimisation. The problem of waste must therefore be addressed within production operations themselves. This makes aviation catering a highly relevant, critical, and strategic research context in examining responsible production practices. Because producers in this context do not have the flexibility to mitigate waste after production, identifying operational improvements, planning accuracy, portion control, and workflow enhancements at production stage holds the greatest potential for impact.

The growing attention towards aviation sustainability globally also creates further urgency for addressing food waste in this sector. The International Air Transport Association (2023) highlights that cabin waste volumes from airlines range between 5 to 6 million tonnes annually, a substantial portion of which is food and associated packaging materials. As the aviation industry recovers to pre-pandemic passenger volumes, food waste generation is expected to increase unless structural production practices are redesigned to reduce unnecessary loss. Additionally, aviation contributes significantly to global greenhouse gas emissions, making the reduction of supply chain related

waste a critical component of aviation decarbonization efforts (IATA, 2023). Therefore, responsible production in airline catering is no longer just an operational efficiency matter—it is directly linked to global climate action, aviation sector sustainability commitments, economic resilience, and regulatory compliance.

Within Scandinavia and particularly Sweden, sustainable production and waste reduction efforts have been prioritized within national climate strategies, environmental policy frameworks, and industry transition roadmaps. Sweden has set national targets to reduce food waste aligned with EU and UN sustainability objectives, and invests heavily in research, innovation, and operational best practices supporting resource-efficient food systems (Swedish Environmental Protection Agency, 2023). Stockholm Arlanda Airport, as one of Northern Europe's major aviation hubs, plays a critical role in Sweden's sustainable aviation agenda. Catering providers located in this context must therefore operate according to both international aviation safety standards and national sustainability expectations. This combination creates an important and high-value research setting that enables analysing how responsible production principles can be implemented in a real-world aviation catering environment while navigating the dual pressures of regulatory compliance and sustainability objectives.

Newrest Arlanda is a professional aviation catering facility located in Sweden, supplying international airline meals for intercontinental flights, charter flights, and long-haul operations. The company operates within a highly structured production environment equipped with modern storage technologies, standardized preparation processes, portioning control systems, and formal operational protocols designed to maintain efficiency and safety. However, like many aviation catering units worldwide, Newrest Arlanda still experiences pre-consumer food waste due to unavoidable production uncertainties, shelf-life constraints, ingredient shrinkage, portioning standardization requirements, risk-averse overproduction, and last-minute operational changes. Understanding how responsible production practices are currently implemented in this context, and how such practices can be strengthened, becomes essential for identifying improvement pathways that are feasible, practical, and compliant with aviation regulations.

Despite growing attention to aviation-related food waste, existing research has provided limited production-stage and decision-focused explanation of how responsible production can be operationalised inside aviation catering facilities under regulatory constraints. There is a limited

amount of empirical case-based research investigating how operational decisions, production planning, workflow design, and internal organizational collaboration impact food waste generation within aviation catering units. Most literature either focuses on broader hospitality sector waste, or conceptual sustainability discussions, but does not deeply examine production-specific drivers within airline catering facilities. This reveals a meaningful research gap, where a systematic investigation of responsible production in a real operational aviation catering environment is needed to generate new academic knowledge and practical solutions.

This thesis aims to address this gap by examining how responsible production practices can be optimized to minimize food waste in aviation catering, using Newrest Arlanda as a case study located in Sweden. By focusing on production-stage waste, and analysing operational practices within a real-world high-regulation, industrial-scale catering unit, this study seeks to contribute to academic understanding while also generating insights applicable for practitioners, catering operators, aviation sustainability strategists and policy stakeholders.

1.2 Problematization

Although food waste has been globally acknowledged as a critical sustainability challenge, the underlying drivers behind food waste in institutional production environments remain insufficiently problematized within academic literature, particularly within the aviation catering context. Much of the existing scholarly work tends to position food waste within the broader hospitality or consumer behaviour domain, often focusing on household-level disposal, plate waste patterns, consumption preferences, retail behaviours, or socio-cultural determinants of waste at the individual level (Thyberg & Tonjes, 2016; Filimonau & De Coteau, 2019; Hebrok & Boks, 2020). While such perspectives contribute valuable insights, they overshadow the fact that a large proportion of food waste occurs prior to reaching consumers, during upstream production stages. Aviation catering represents one of the clearest examples where waste is overwhelmingly generated before the point of consumption, yet academic attention to this specific domain remains limited (Hennchen, 2019; Mirosa et al., 2023). The lack of academic focus on industrial food manufacturing systems, especially those operating under strict regulatory risk and biosecurity constraints, creates a significant empirical blind spot in global waste research.

Crucially, the gap is not that aviation catering has never been studied, but that it has often been studied at the wrong analytical level for the problem addressed here. Where existing aviation food-waste research foregrounds downstream waste quantities, passenger behaviour, or general sustainability discussions, it tends to under-specify how waste is structurally produced upstream through planning assumptions, operational buffers, workflow handovers, and compliance-driven discard thresholds within the catering facility itself (Ross, 2014; Chen & Hidalgo, 2021). As a result, the causal mechanisms that matter most for prevention, how managers and teams translate uncertainty into "safe" overproduction, how responsibility is interpreted under Category 1 disposal rules, and how operational routines normalise surplus, remain insufficiently explained (Hennchen, 2019; Mirosa et al., 2023). This study addresses that explanatory gap by analysing the internal production rationalities that institutionalise waste before meals leave the facility.

Furthermore, research tends to assume that food waste mitigation can be achieved through circular economy initiatives such as redistribution, composting, valorisation, feed conversion, or reprocessing (Aschemann-Witzel et al., 2021; Garcia & Patel, 2020). However, these assumptions do not hold in the aviation sector. Within European regulatory conditions, aviation-derived food waste from international flights is classified as Category 1 material under Regulation (EC) No. 1069/2009, requiring mandatory destruction through incineration to eliminate biosecurity risks (European Commission, 2024). This regulatory condition fundamentally prohibits mainstream circular interventions that dominate sustainability literature. Therefore, responsible production in aviation catering must be addressed upstream, within production, planning, portioning, storage and assembly processes, rather than downstream after the food has already been transported to aircraft. Yet, current research rarely interrogates production decisions and operational routines which lead to overproduction, safety wastage, and shelf-life driven disposal in such high-regulation food manufacturing environments.

This reveals a deeper conceptual gap: the dominant academic narratives on food waste frequently overlook the interaction between operational systems, regulatory constraints, production planning uncertainties, and industrial-scale catering realities. As a result, the root causes of avoidable pre-consumer waste in aviation catering remain under-theorised and under-explored. Research is yet to sufficiently analyse how production units practically implement responsible production practices under pressure from time constraints, forecasting complexities, rigid quality standards,

fluctuating passenger loads, and international safety demands (Chen & Hidalgo, 2021; Akkerman et al., 2010). Moreover, while sustainability discourse increasingly emphasises the need for systemic transformation, practical knowledge on *how* institutional food production sites operationally translate responsible production ambitions into daily decisions, routines and workflows is limited (Jaffee et al., 2019). Thus, a disconnect emerges between global sustainability goals and the micro-operational environment realities where waste is structurally produced.

There is also an underdeveloped empirical understanding regarding how aviation catering providers internally perceive food waste, how they navigate trade-offs between safety compliance and resource efficiency, and how organisational assumptions, internal risk norms, operational culture, and production logics contribute to particular waste outcomes. Research shows that institutional actors often normalise waste as a "cost of doing business" in contexts where predictability is difficult and safety is paramount (Hennchen, 2019). In aviation catering, this normalisation becomes even more pronounced given the limited opportunity for post-production correction. Yet, little is known about the organisational rationality behind such decisions, nor how production teams and managers interpret their room for improvement within regulatory structures.

Additionally, although global aviation is undergoing its own sustainability transitions, with increasing focus on decarbonisation pathways, resource optimisation and environmental stewardship (IATA, 2023), academic work has not yet sufficiently explored aviation catering as a strategic arena of sustainability transformation. As food waste reduction is directly linked to emission reduction, energy optimization, and resource efficiency, research within aviation catering can generate high-impact knowledge relevant to both the aviation sustainability agenda and global SDG targets. Nevertheless, scholarly output on aviation catering remains sparse, fragmented, and primarily descriptive. Empirical case-based evidence on production-level responsible practices is particularly lacking.

Sweden's strong national commitment to food waste reduction and its policy alignment with SDG 12.3 present an opportunity to explore this research need within a mature sustainability governance context (Swedish Environmental Protection Agency, 2023). Stockholm Arlanda Airport, as a major international hub, and Newrest Arlanda as an industrial-scale catering facility operating within this context, provide an appropriate empirical setting where responsible production practices can be examined in depth. Investigating this context allows for understanding not only

what practices currently exist, but how operational decision-making, production routines, coordination structures, material handling, and organizational assumptions shape food waste dynamics.

1.3 Research Aim

The aim of this study is to explore how responsible production practices can be strengthened to minimise food waste within the production stage of aviation catering operations in the context of Newrest Arlanda, Sweden.

1.4 Research Questions

RQ1: How do current production practices and operational routines contribute to food waste generation within aviation catering at Newrest Arlanda?

RQ2: In what ways can responsible production practices be improved to minimise food waste within the production environment of aviation catering at Newrest Arlanda?

2. Literature Review

This chapter synthesizes prior empirical research on food waste in aviation catering and institutional food production environments. It critically reviews existing evidence on production-stage waste drivers and responsible production interventions. This literature review identifies what is known, what is insufficiently explored, and where this thesis contributes to advancing knowledge.

2.1 Pre-Consumer Food Waste within Institutional Food Production Systems

Global food waste research has historically prioritised household, retail and consumption-stage waste, while upstream institutional production waste has received comparatively weaker academic attention (Papargyropoulou et al., 2019; Schanes et al., 2018). This is problematic because growing empirical evidence suggests that production-driven waste in institutional food systems, hospitals, catering factories, large-scale kitchens, universities, aviation caterers, corporate canteens, is not only quantitatively significant, but structurally embedded in production design itself (Eriksson et al., 2020). Unlike household waste, which is strongly behaviourally influenced and heterogeneous, institutional waste is systemically produced through standardized industrial processes, fixed specifications, batch sizing requirements, professionalization of workflow, and regulatory protocols (Engström et al., 2022). Therefore, interventions that focus only on consumer behavioural change (households/retail) do not transfer into institutional settings, and this is a major conceptual and empirical gap in food waste literature (Dhir et al., 2020). The priority in institutional contexts is not persuasion of individual consumption behaviour but redesigning production systems to structurally prevent avoidable waste upstream before it becomes "waste" (Goonan et al., 2014; Parfitt et al., 2010).

A stream of studies highlights that waste that occurs during production can sometimes exceed waste observed at consumption stages, particularly in highly standardized institutional kitchens (Mirosa et al., 2023). This observation challenges the dominant mainstream assumption that final consumer behaviour is the primary driver of waste. Scholars like Evans (2012) argue that most food waste scholarship has over-privileged post-consumer behavioural explanations because they appear normatively compelling and interventionally simple (nudging, education, social norms). However, institutional food waste is not primarily a function of irrational consumption behaviour,

but more frequently a result of production systems built for risk insulation, regulatory compliance, buffer-stock provisioning and workflow efficiency under uncertainty (Ross, 2014). Thus, unlike household food waste scholarship which tends to view waste as preventable through individual rationality correction, institutional contexts require structural redesign logic.

Evidence from hospitals demonstrates this system-embedded pattern. Eriksson et al. (2020) found that pre-service food losses in Swedish hospital kitchens were significantly higher than waste found on plates, caused largely by misalignment between production batch sizes and actual patient intake. Goonan et al. (2014) similarly found in New Zealand hospitals that production-side waste arises from standardized recipes and safety-mandated pre-preparation buffers. This contrasts directly with findings in household waste literature (e.g., Hebrok & Boks, 2017), which frame waste as linked to convenience culture or poor meal planning behaviour. The contradiction between these bodies of research demonstrates the need for differentiated epistemological treatment of institutional upstream waste, it cannot be treated conceptually as a variant of household waste (Goonan et al., 2014; Hebrok & Boks, 2017).

Similarly, in foodservice manufacturing, waste emerges because production decisions occur before demand certainty exists (Grunow & Gobbi, 2009; Akkerman et al., 2010). In institutional production settings, waste is therefore rationalised rather than accidental, designed to protect against catastrophic failure more than to minimise environmental impact. Reynolds et al. (2019) argue this creates a "pre-consumer waste paradox": organisations intentionally create surplus production because the operational value of avoiding service failure outweighs the sustainability value of reducing waste. This rationality does not appear in household food waste, because households do not operate under contractual mega-risk terms equivalent to hospitals, airlines, or industrial catering facilities.

Comparative studies in restaurants and institutional catering further reinforce the point. Wang et al. (2017) and Zhang et al. (2020) identify that restaurant waste can still be partially responsive to customer behaviour (menu choices, portion returning behaviour). But in industrial catering settings, studies show that employees themselves frequently have no agency to adjust portion size or buffer meal allocation (Principato et al., 2018; Betz et al., 2015). Standardization eliminates discretion.

Consequently, institutional waste is an operational systems problem rather than a behavioural choice problem.

This is why scholars in food waste research call for upstream waste research specifically (Dhir et al., 2020) and why institutional food production should be treated as a distinct subfield of food waste literature, not an extension of domestic waste literature. Even the implementation pathways differ. Household waste mitigation calls for hierarchy approaches such as education, awareness, behavioural nudges (Reynolds et al., 2019; Schanes et al., 2018), whereas institutional mitigation demands structural realignment, process control, forecasting precision, batch optimization, workflow redesign (Göbel et al., 2015). Further, the evidence base for pre-consumer institutional waste suggests that upstream interventions have disproportionately greater measurable impact compared with downstream interventions (Mourad, 2016). Because upstream waste is generated before food is served, every kg prevented upstream avoids all downstream embedded emissions and resource losses (Tonini et al., 2018). Downstream consumer-level approaches merely reduce disposal quantity, not production inefficiency (Dora et al., 2016). Therefore, institutional upstream waste reduction has stronger climate mitigation leverage.

Another crucial dimension is regulatory entanglement. Research demonstrates that institutional food systems, especially in high-risk sectors, operate under safety regimes that force disposability, preventing redistribution of near-expiry or surplus items (Engström et al., 2022). This again does not apply to households. In many countries, household surplus can be shared, donated, repurposed, composted or frozen. Industrial catering cannot do this freely in many regulated domains (Alexander & Smaje, 2008; Göbel et al., 2015). Therefore, the nature of waste interventions feasible is constrained by legal context. Institutional food waste must be prevented, because after it is produced, policy often forbids any route other than destruction. This also explains why scholars argue that the most effective lever for institutional waste reduction is production stage reform, not post-disposal solution design (Papargyropoulou et al., 2014; Damiani et al., 2021). The food waste hierarchy itself is interpreted differently when applied in production sectors. Instead of focusing on disposal tiers, institutional waste science must focus on elimination before production (Mourad, 2016).

Another contrast emerges in the literature regarding data transparency. Household waste has measurement problems because data comes from consumer self-reporting (Schanes et al., 2018).

Institutional production waste however has measurement problems because waste is normalised as operational cost and therefore not documented precisely (Teigiserova et al., 2020). Waste is internalized into system equilibrium rather than problematised. This again differentiates institutional waste science structurally from household waste. Institutional food production is also embedded in industrial labour design, assembly lines, task division, specialisation, throughput optimisation (Dora et al., 2016). Lean production perspectives show that production design itself may create waste-generating friction points (Vlachos, 2015; Gładysz et al., 2020). Household waste literature cannot explain this phenomenon because households do not operate under industrial work design constraints.

Food waste cannot be treated conceptually as a universal behavioural or cultural problem. Institutional production waste is a fundamentally different research category requiring system design and production operations scholarship (Papargyropoulou et al., 2014; Damiani et al., 2021). The gap in global research is therefore not that food waste has been insufficiently studied—it is that food waste has been studied through the wrong unit of analysis (household-centric). Hence, pre-consumer institutional food waste must be treated as a primary area of inquiry, because interventions available, causal mechanisms, regulatory constraints, and effectiveness differentials are structurally distinct. Therefore, institutional food production waste is academically relevant not because it reflects a "higher magnitude" problem than households per se, but because structurally upstream waste represents the highest preventability potential and highest climate leverage in the food chain (Tonini et al., 2018; Kummu et al., 2022).

2.2 Aviation Catering as a High-Constraint and High-Regulation Production Environment

Aviation catering has been repeatedly identified as one of the most operationally constrained food production environments globally, yet academic literature addressing waste in this sector remains fragmented, methodologically thin, and often analytically underdeveloped (Chen & Hidalgo, 2021; Thamagasorn & Pharino, 2019). Unlike conventional foodservice environments, aviation catering operates under extreme conditions of regulatory compliance, biosecurity control, demand unpredictability, production accuracy pressures, and rigid timing windows (Thamagasorn & Pharino, 2019). These structural conditions do not merely influence food waste outcomes; they actively construct them. Therefore, waste in aviation catering cannot be explained through the same causal pathways used to explain food waste in restaurants, households, or hospitals

(Geissdoerfer et al., 2017). This distinction becomes critical to establish because the dominant conceptual logic around food waste prevention in hospitality is often behaviour-centric or consumer-response dependent (Filimonau & De Coteau, 2019), whereas aviation catering is production-centric and compliance-driven by design.

Current research tends to assume that improvements can be achieved through standard circular economy interventions such as redistribution, reuse, or alternative valorisation pathways (Damiani et al., 2021). However, these assumptions fundamentally break down within aviation catering. EU legislation classifies international inbound catering waste as Category 1 "highest risk" animal by-product waste (European Commission, 2024). This classification legally mandates destruction by incineration. Thus, unlike hotels and restaurants where unused food can be donated (Mourad, 2016; Alexander & Smaje, 2008), aviation catering cannot rely on downstream recovery to compensate for upstream inefficiency. Downstream mitigation options are legislatively blocked. This legal constraint fundamentally shifts the strategic leverage point: waste MUST be eliminated before production. This contradicts a large body of circular economy research which prioritises post-production flows (Ellen MacArthur Foundation, 2019). Aviation waste management therefore becomes a regulatory compliance optimisation domain, not a circular redistribution problem, and yet most scholarly models on circular food systems implicitly assume valorisation potential (Damiani et al., 2021). This tension shows that generic circularity frameworks are insufficient when applied to high-regulatory aviation contexts.

Additionally, unlike restaurant waste which reflects customers' dynamic decisions in real-time (Wang et al., 2017; Zhang et al., 2020), aviation catering allocates meals prior to knowing passenger consumption behaviour. Forecasting passenger counts is probabilistic, influenced by late check-ins, standby passengers, aircraft changes, last-minute airline uplifts, and IATA security protocols on minimum buffer provisioning (Aghazadeh, 2025). Researchers such as Akkerman et al. (2010) have argued that demand uncertainty is the single most powerful structural variable determining waste in food distribution chains. In aviation catering, this uncertainty is amplified because meals cannot be produced "on-demand" as restaurants do (Zhang et al., 2020). Production is industrial batch based, sealed, quality assured, chilled, packed and dispatched before demand is known. This is why waste is not a failure of planning, it is the consequence of regulatory and operational probabilistic obligation. Therefore, aviation catering studies (Mirosa et al., 2023;

Thamagasorn & Pharino, 2019) contradict behaviour-based waste models and instead align more closely with operational risk-buffer design frameworks from industrial engineering.

Further, prior studies exploring food waste in airlines have used consumer behaviour as analytical anchor (You et al., 2020; You, 2022) — focusing on why passengers waste food. While this expands understanding of consumption waste, this approach obscures the root cause: waste generated long before the meal enters the aircraft. Chen and Hidalgo (2021) show that even when passengers consume almost all served food, production-stage waste at caterer level remains the dominant loss point. This contrasts with hotel or restaurant literature where plate waste is the main focus (Principato et al., 2018). Therefore, aviation catering literature must shift research emphasis upstream rather than downstream. The problem is not "why passengers waste meals", the problem is "why production waste is structurally generated before meals even board the plane" (You, 2022). This reversal in analytical lens fundamentally challenges the conventional "final consumer" centricity embedded in hospitality-based waste scholarship.

Equally, aviation catering is shaped by temporal rigidity. Service windows are non-negotiable, aircraft turnaround time is measured in minutes, not hours (You et al., 2020). Airlines do not wait for kitchens. This sharply contrasts with restaurant operations which can extend preparation time or adjust menu execution dynamically (Wang et al., 2017). The pressure to meet departure time creates deterministic production batching. Dora et al. (2016) argue that such rigidity forces kitchens to over-produce in order to eliminate the catastrophic risk of stockout. Aviation caterers cannot risk shortages under any circumstance. This creates a structurally asymmetrical risk calculus: overproduction is rational, underproduction is unacceptable. The literature on restaurant production, which advocates flexible cook-to-order systems (Heikkilä et al., 2016), cannot be applied in aviation due to temporal immobility and dispatch constraints.

Additionally, production precision is not solely a function of forecast, but also standardization (Mirosa et al., 2023). Airline catering menus are defined by airline brand specifications, standard portioning, plating templates, and exact recipe uniformity (Ross, 2014). Unlike restaurants that adjust servings based on demographic profile, premium / non-premium customer type, or dynamic demand, aviation catering is governed by contractual specifications. Standardization functions as risk-transfer and quality consistency mechanism. But standardization also structurally embeds design-rigidity that makes over-portioning, batch-inflexibility, and packaging wastage more likely

(Akkerman et al., 2010). Therefore, literature demonstrating that menu customization lowers waste in retail or restaurants (Cicatiello et al., 2016) is non-transferable to aviation catering.

Notably, scholars argue that aviation catering represents one of the few industrial catering sectors where downstream waste is not the primary problem (Mirosa et al., 2023; Chen & Hidalgo, 2021). The majority of waste is invisible to passengers and occurs long before the meal is served: in cutting, trimming, chilling, holding, labelling, assembly, re-portioning, sealing, or meeting microbiological safety buffer requirements (Geissdoerfer et al., 2017). These operational steps each create waste streams that consumer-focused waste research frameworks simply cannot explain. Therefore, aviation catering requires its own operational waste literature domain.

The limited research that exists on aviation catering therefore tends to be case-based and exploratory (Ross, 2014; Mirosa et al., 2023). While this provides emergent empirical foundation, it also shows the severe under-theorisation in this domain. For example, no consensus exists on which production-stage intervention has highest leverage, because each aviation catering environment contains unique risk regimes, scale constraints, airline expectations, and infrastructure realities. Thus, generalisation is weak, the sector currently lacks comparative cross-case theory building. This absence stands in contrast to institutional hospital waste literature which is more mature and theoretically structured (Engström et al., 2022; Eriksson et al., 2020). Aviation catering research, comparatively, remains early-stage and exploratory rather than cumulative.

2.2.1 Limitations of Existing Aviation Catering Waste Research

Existing research on food waste in aviation catering has made several important contributions. First, it has successfully established that aviation catering is a high-waste food-service context, characterised by large volumes of pre-consumer waste and limited opportunities for downstream recovery due to biosecurity and food-safety regulation (Ross, 2014; Thamagasorn & Pharino, 2019; Chen & Hidalgo, 2021). Second, prior studies have documented the scale and composition of aviation-related food waste, including cabin waste, unused meals, and catering returns, thereby raising industry and policy awareness of the sector's environmental impact (You et al., 2020; IATA, 2023). Third, consumer-oriented research has contributed insights into passenger food preferences, meal acceptance, and plate-waste behaviour, which has informed airline service design and menu optimisation discussions (You, 2022). Collectively, this body of work has

established aviation catering as a legitimate sustainability concern within both academic and industry discourse.

However, despite these contributions, existing aviation catering research exhibits systematic analytical limitations. Much of the literature locates the food-waste problem downstream, focusing on consumption outcomes, waste quantities, or post-flight disposal, rather than on the upstream production decisions that generate surplus before meals ever reach the aircraft (Chen & Hidalgo, 2021; Mirosa et al., 2023). Aviation catering is frequently treated as a variant of hospitality food service, applying behavioural or circular-economy logics that assume the feasibility of redistribution, reuse, or recovery, assumptions that do not hold under Category 1 disposal regulations governing international aviation catering waste (Papargyropoulou et al., 2014; European Commission, 2009). As a result, the literature often describes *what* is wasted, but provides limited explanation of *how* and *why* waste is structurally produced within catering facilities operating under coercive regulatory, contractual, and operational constraints.

More specifically, prior research under-theorises the internal production decision logics that shape waste generation in aviation catering. There is limited empirical examination of how forecasting uncertainty is translated into safety buffers, how airline specifications constrain portioning and menu flexibility, how workflow fragmentation across production stages amplifies surplus, and how compliance norms normalise overproduction as an acceptable risk-management strategy (Akkerman et al., 2010; Hennchen, 2019). The perspectives of production managers, planners, supervisors, and frontline staff, those directly responsible for translating institutional requirements into daily production decisions, remain comparatively underexplored. Consequently, existing studies struggle to explain why waste persists even in technologically advanced, professionally managed aviation catering environments.

This study addresses this blind spot by shifting the analytical focus from waste outcomes to production-stage decision-making within aviation catering facilities. Rather than asking how much waste is generated or how it is disposed of, the study examines how responsible production is interpreted, enacted, and constrained within a highly regulated institutional setting.

2.3 Responsible Production Practices to Reduce Food Waste in Industrial Catering

The literature addressing waste reduction interventions in institutional food production consistently demonstrates that the most impactful leverage is in redesigning production practices rather than attempting end-stage residue management (Papargyropoulou et al., 2014; Reynolds et al., 2019). Yet, research findings are conflicting on which production practices are most effective, and whether operational transformation is primarily a technical optimisation problem, a managerial coordination problem, or a cultural/behavioural operations problem (Papargyropoulou et al., 2014). This disagreement signals a fundamental tension in the field: responsible production is conceptually acknowledged, but empirically fragmented and poorly operationalised within industrial catering contexts (Reynolds et al., 2019).

Many studies emphasise production forecasting precision and data-driven demand estimation as central levers in reducing upstream institutional waste (Grunow & Gobbi, 2009; Akkerman et al., 2010). Analytically, this argument treats food waste as the result of variance between predicted and realised consumption. However, this view is challenged by studies showing that even strong forecasting accuracy does not eliminate waste when production systems are standardised, time-constrained, and risk-buffer embedded, as in aviation or hospital catering (Eriksson et al., 2020; Engström et al., 2022). Forecasting-led interventions assume that the primary cause of waste is informational uncertainty. Yet in controlled institutional environments where production occurs prior to demand confirmation, uncertainty is structural, not informational (Grunow & Gobbi, 2009). Therefore, the forecasting paradigm alone cannot meaningfully address waste if the organisational logic prioritises safety margin over optimization (Akkerman et al., 2010). This reveals a conceptual split: responsible production cannot be reduced only to better prediction capability.

Another major cluster of research emphasises operational workflow redesign and waste minimisation through industrial lean production logics (Dora et al., 2016; Gładysz et al., 2020; Vlachos, 2015). These studies argue that food waste is primarily a manifestation of operational inefficiencies, idle time, movement waste, over-processing, inconsistent portioning, poorly synchronised sequencing of tasks, or unnecessary handling steps. These scholars thus treat waste as a derivative of systems inefficiency rather than risk-driven buffers (Dora et al., 2016; Gładysz et al., 2020). The empirical contradiction between the forecasting paradigm and the lean

operational paradigm is important: forecasting assumes waste is an unavoidable but reducible uncertainty outcome, whereas lean focused scholarship assumes waste is solvable through structural removal of inefficiencies (Eriksson et al., 2020). The difference is not trivial, because it implies two opposing causal mechanisms. Responsibility in production becomes conceptualised differently depending on which assumption is adopted, and this leads to divergent intervention designs (Reynolds et al., 2019).

Some scholars highlight organisational culture and behavioural alignment amongst production employees as the most influential determinant shaping whether responsible production practices are even adopted (Vizzoto et al., 2020; Lo et al., 2012). These findings claim that waste persists not because technical solutions do not exist, but because organisations normalise buffer provisioning, tolerate sub-optimal routines, and maintain cultural narratives that "waste is safer than shortage." Behaviourally driven studies argue that without operational meaning-change, technical intervention remains symbolic (Vlachos, 2015; Vizzoto et al., 2020). However, this behavioural school has been criticised for lacking operational mechanistic specificity and focusing too abstractly on generic green behaviour constructs. Critics highlight that "employee engagement" explanations do not engage sufficiently with the structural constraints embedded in industrial catering contracts and regulatory mandates (Dhir et al., 2020). A behavioural culture focus may be suitable for restaurants where employees have micro-discretion (Heikkilä et al., 2016), but not necessarily applicable when operational decision-making is structurally centralised in industrial production units.

Additionally, scholars who advocate circular economy integration into industrial catering (Damiani, 2021; Garcia & Patel, 2020) frequently propose redistribution, repurposing, or valorisation as responsible production pathways. But in aviation catering and similarly regulated sectors, regulatory constraints negate this approach (Papargyropoulou et al., 2014). This produces another divergence: the circularity paradigm assumes responsibility emerges *after* the surplus exists, whereas industrial high-regulation contexts require responsibility to emerge *before* surplus is produced. Responsible production therefore needs conceptual reframing: not redesigning waste flows, but preventing their creation structurally (Lo et al., 2012; Dhir et al., 2020). The literature has not reconciled this circularity-responsibility contradiction, signalling the need for context-specific intervention logic (Heikkilä et al., 2016).

Responsible production practices in institutional catering have been found to benefit from more granular micro-interventions that target specific operational nodes such as portion standardisation accuracy, yield optimisation during cutting and trimming, and SKU reduction to improve predictability (Göbel et al., 2015; Betz et al., 2015). This literature provides more actionable operational leverage points compared to more abstract systemic claims. However, this cluster of research tends to be geographically narrow (primarily European hospital canteens and Swiss foodservice studies) and lacks generalisability into hyper-regulated contexts where disposal cannot be avoided (Engström et al., 2022; Eriksson et al., 2020). The lack of cross-context comparative research limits its extrapolative validity.

What becomes analytically relevant when comparing these diverging bodies of research is the degree to which responsibility is framed as a design-time concept versus an execution-time concept. Forecasting scholars treat responsibility as a function of accuracy enhancement, emphasising demand-prediction fidelity as the core lever of waste avoidance (Grunow & Gobbi, 2009; Aghazadeh, 2025). Lean scholars frame responsibility as system simplification, arguing that structural flow efficiency reduces unnecessary resource use at its origin (Womack & Jones, 1996; Dora et al., 2016). Behavioural scholars position responsibility within employee alignment and pro-environmental enactment, foregrounding staff behaviour as a primary intervention point (Lo et al., 2012; Vizzoto et al., 2020). Circular economy scholars, by contrast, conceptualise responsibility through post-creation stewardship and value retention mechanisms beyond linear throughput (Ellen MacArthur Foundation, 2019; Geissdoerfer et al., 2017). These intellectual tensions demonstrate that responsible production is not a singular operational philosophy, it is a conceptual battleground where normative assumptions differ on where responsibility should be enacted. For industrial catering environments, the strongest argument emerging from comparative literature is that responsibility must be structurally positioned before production, embedded in production-planning logic rather than at end-of-pipe intervention stages (Papargyropoulou et al., 2014; Tonini et al., 2018).

The most credible synthesis emerging is that responsible production requires an integrated operational decision architecture in which (1) buffer creation triggers organisational scrutiny, (2) excess is problematised rather than normalised, and (3) production parameters are continually challenged through empirical evidence rather than institutional habit (Eriksson et al., 2020;

Engström et al., 2022). Yet much institutional research continues to stop at describing generic intervention categories without evaluating which interventions are actually feasible under specific regulatory or operational constraints (Lo et al., 2012; Mirosa et al., 2023). This lack of comparative prioritisation and constraint-sensitive ranking remains a major empirical limitation in the current literature.

2.4 Implications of the Literature Review for This Study

The literature review highlights that while food waste has been widely studied, important analytical and empirical gaps remain in relation to institutional food production and, more specifically, aviation catering. These shortcomings have direct implications for the design, focus, and methodological choices of this study.

First, the literature demonstrates that most food-waste research, including aviation-related studies, prioritises waste outcomes, quantities, and downstream disposal practices, while giving limited attention to the institutional constraints and regulatory pressures shaping production-stage decisions (Papargyropoulou et al., 2014; Chen & Hidalgo, 2021; Mirosa et al., 2023). Because these institutional dynamics cannot be meaningfully captured through quantitative measurement alone, this study adopts a qualitative research approach to explore how production decisions are interpreted and enacted within a highly regulated environment.

Second, the review shows that existing studies under-theorise how production decisions are made inside catering facilities, particularly regarding forecasting buffers, portioning rules, workflow coordination, and compliance-driven overproduction (Akkerman et al., 2010; Hennchen, 2019). This gap directly informs the choice to collect data through semi-structured interviews with production managers, supervisors, planners, and frontline staff, as these actors are responsible for translating institutional requirements into daily production practices.

Third, much of the literature explains food waste in terms of observable outcomes rather than the reasoning and sensemaking processes that produce those outcomes (Evans, 2012; Dhir et al., 2020). To address this limitation, the study adopts an abductive analytical approach, focusing on how participants understand responsibility, risk, compliance, and waste within their operational context, with relating to the institutional theory and lean production theory.

Finally, the review identifies a lack of in-depth, production-stage case studies examining how responsible production operates in real-world aviation catering environments subject to strict biosecurity regulation and airline specifications (Mirosa et al., 2023; Thamagasorn & Pharino, 2019). This directly motivates the selection of a single embedded case study design, allowing for detailed examination of production routines, decision logics, and institutional constraints within one organisational setting, rather than surface-level comparison across multiple sites.

3. Theoretical Background

This chapter presents the theoretical foundations guiding this study. Two complementary theories, Institutional Theory and Lean Production Theory, are applied to interpret why production waste emerges in aviation catering and how responsible production practices can be operationalised. These theories collectively support the analytical lens used to examine this case context.

3.1 Institutional Theory

Institutional theory argues that organisations behave not only based on economic optimisation, but according to pressures that originate from the institutional environment in which they operate (DiMaggio & Powell, 1983; Scott, 2008). Meyer and Rowan (1977) emphasise that organisations often adopt practices that preserve legitimacy even when these practices are economically inefficient, while Bromley and Powell (2012) further argue that formal structures frequently symbolise compliance rather than improve actual performance. This contrasts with rationalist operations perspectives which assume decision making seeks efficiency maximisation (Akkerman et al., 2010). Institutional theory instead explains that in many industries, organisations comply with rules because violating these rules risks sanctions, reputation loss, or withdrawal of license to operate (Scott, 2008). Therefore, institutional theorists conceptualise organisational decisions as legitimacy seeking, whereas classical systems engineering conceptualises them as optimisation seeking. In highly regulated food sectors such as aviation catering, legitimacy often becomes more important than operational efficiency, which means waste prevention cannot be understood solely within technical engineering logic.

Institutional theory identifies three types of pressures: coercive, normative and mimetic forces (DiMaggio & Powell, 1983). Coercive forces arise from legally binding rules and regulatory enforcement (Scott, 2008). Normative pressures emerge from professional standards and technical expectations embedded in industries (Greenwood et al., 2011). Mimetic pressures arise when organisations copy others to reduce uncertainty (DiMaggio & Powell, 1983). Scholars argue coercive pressures exert the strongest influence in safety critical environments (Scott, 2008; Bromley & Powell, 2012), while normative pressures dominate in professions such as medicine or accounting (Greenwood et al., 2011). However, Meyer and Rowan (1977) maintain that in contexts where uncertainty is high, mimicry becomes a rational survival mechanism, while later studies

argue mimicry has weakened due to increased regulatory specificity in modern systems (Bromley & Powell, 2012). These disagreements reflect debates inside institutional scholarship itself regarding which pressure dominates under which structural configuration. For aviation catering, coercive logic is dominant because international animal by-product law, border biosecurity standards and EU food safety regulation define acceptable behaviour, and this coercive structure functions differently than normative professional consensus in ordinary hospitality.

Institutional theory therefore provides a direct explanatory foundation for why food waste persists in highly regulated institutional food systems. Regulatory compliance forces organisations to produce safety margins, buffer quantities and rigid standardisation (Scott, 2008), while engineering optimisation theories would argue these volumes should be mathematically minimised (Akkerman et al., 2010). The institutional position argues that eliminating these buffers increases institutional risk and threatens legitimacy more than it reduces cost (Meyer & Rowan, 1977), while operations management argues that buffer creation is inefficiency (Akkerman et al., 2010). In aviation catering, where Category 1 disposal rules make redistribution illegal, institutional theorists argue safety certainty will override sustainability priorities (European Commission, 2024). Empirical aviation waste research supports this institutional primacy finding: Mirosa et al. (2023) found waste rationalised internally as "zero-risk compliance outcome," and Chen and Hidalgo (2021) found managers avoided production reduction decisions because it raises compliance uncertainty. Thus, institutional theory explains the root cause of production waste not as mismanagement, but institutional rationality.

Institutional logics theory extends classical institutional theory by arguing organisations operate within multiple competing logics, professional logic, commercial logic, regulatory logic, and sustainability logic, that coexist and conflict inside organisational fields (Thornton et al., 2012). Scholars argue one logic often dominates, shaping which logic any organisation prioritises (Greenwood et al., 2011). In aviation catering, regulatory coercive logic dominates above sustainability logic because legal compliance determines survival, whereas sustainability logic is aspirational and secondary. This perspective challenges linear sustainability frameworks which assume organisations align behaviour with environmental goals if knowledge and awareness exist (Evans, 2012), and contradicts behavioural environmental psychology research which assumes that staff values drive action (Vizzoto et al., 2020). Institutional logics scholars argue sustainability

logic becomes actionable only when aligned with stronger institutional logics (Thornton et al., 2012).

There is also disagreement in institutional research regarding whether institutional pressures lead to convergence or divergence in organisational practice. DiMaggio and Powell (1983) argue pressures lead to isomorphism, where organisations in the same field become homogeneous. However, Lawrence and Suddaby (2006) argue institutional entrepreneurs can disrupt these logics and drive divergent change. Bromley and Powell (2012) argue modern organisations increasingly adopt symbolic compliance where formal structures mimic conformity but decouple from technical functioning. These contrasting views produce different implications for responsible production. If isomorphism dominates, aviation caterers will not reduce waste unless regulators and airline clients collectively change rules. If institutional entrepreneurship dominates, caterers could attempt to shift meaning structures around "acceptable safety margin." If symbolic compliance dominates, caterers may report sustainability ambitions but operationally preserve current risk buffers. Aviation catering field evidence suggests symbolic compliance is plausible: airlines frequently publicise sustainability commitments while accepting mandatory waste-incineration outcomes (Chen & Hidalgo, 2021; Mirosa et al., 2023). Therefore, institutional theory suggests responsible production change requires institutional field alignment, not only organisational internal process improvement.

Institutional theory is therefore critical to conceptualising responsible production in this research because it reframes food waste as an institutional product, not merely an operational inefficiency. While lean theory conceptualises waste as "non-value adding activity," institutional theory conceptualises waste as "institutionally rational activity." These two views contradict each other ontologically. Lean argues waste is failure to optimise flow (Dora et al., 2016), while institutional theory argues waste protects legitimacy (Scott, 2008). This theoretical contradiction is not methodological, it is epistemological. For this research, institutional theory provides the causal explanation for why internal operations cannot simply optimise waste away unless institutional permission and institutional alignment shifts. The institutional lens therefore explains the boundaries of operational feasibility better than operations management theory can (Mirosa et al., 2023).

Finally, institutional theory clarifies why a case study approach is methodologically justifiable for studying responsible production in aviation catering. Case study methodology is specifically recommended when researching how institutional constraints shape organisation-level decisions (Yin, 2018), because institutional processes are embedded, socially constructed, and field-specific. Denzin (1978) and Eisenhardt (1989) argue theory-building case studies can reveal how institutional forces operate in specific contexts, which is necessary when studying under-theorised domains such as aviation catering. Thus, institutional theory not only supports theoretical causal interpretation, but also supports the methodological logic and epistemic purpose of the case qualitative research design.

3.2 Lean Production Theory

Lean Production Theory originates from the Toyota Production System and conceptualises organisational efficiency through systematic identification and removal of waste from production processes (Womack & Jones, 1996; Imai, 1986). Lean production rejects the assumption that waste is an unavoidable by-product of industrial processes, and instead argues that waste is a designed outcome of poor system configuration, lack of flow discipline, overproduction and unnecessary resource utilisation (Liker, 2004). In contrast to Institutional Theory, which frames waste as rational legitimacy preservation, Lean Production Theory frames waste as a structural inefficiency that should be actively eliminated (Dora et al., 2016). Lean views waste not as a consequence of compliance, but as a symptom of value stream distortion, this fundamental epistemological difference between institutional logic and lean logic is important for this research. Lean theorists argue that waste emerges because production systems are designed around capacity maximisation or risk avoidance rather than value maximisation (Womack & Jones, 2003). This central theoretical divergence makes Lean Production Theory relevant to this research, because aviation catering provides a context where waste arises precisely because operations are designed for risk insulation rather than flow optimisation.

Lean Production Theory identifies seven classical waste types: overproduction, waiting, unnecessary motion, excessive inventory, defects, over-processing and unnecessary transportation (Womack & Jones, 1996). Researchers have demonstrated that these waste types occur not only in manufacturing, but also in food service, logistics and supply chain environments (Vlachos, 2015; Dora et al., 2016). Lean research in food systems reveals that excessive inventory,

overproduction and over-processing are the most prominent waste forms in industrial catering (Gładysz et al., 2020), while overproduction alone yields the largest volume of wasted food (Dora et al., 2016). However, other scholars argue that lean alone cannot fully explain why overproduction persists in institutional food settings where production occurs under safety-rationale constraints (Parfitt et al., 2010; Eriksson et al., 2020). This argument challenges the lean foundational assumption that all waste can be eliminated through better system design. In aviation catering, overproduction is structurally embedded because production decisions occur under extreme uncertainty and coercive regulatory pressure. This is why purely lean theoretical logic cannot fully explain the production reality. Yet lean still provides a critical theoretical lens because it explains how internal operational routines and production flow structures intensify waste in situations where institutional constraints already set mandatory minimums.

Lean theory also challenges the belief that productivity and sustainability are competing priorities. Several empirical studies demonstrate that lean implementation correlates with improved environmental performance because waste elimination reduces material losses and resource throughput (King & Lenox, 2001; Baines et al., 2012). Similarly, Burritt and Schaltegger (2014) argue that lean operations inherently produce environmental benefits even if environmental goals were not originally intended. However, this is contested by scholars who show lean sometimes increases environmental harm by compressing time buffers and reducing flexibility for rework or reuse (Ogino et al., 2019). These contrasting findings highlight an important theoretical debate: does lean automatically deliver sustainability benefits or do such outcomes require intentional environmental integration? For aviation catering, this debate is relevant because lean may reduce waste but could also reduce safety redundancy if not aligned with regulatory constraints. Therefore, lean theory contributes to a tension between operational optimisation and institutional safety requirements.

Lean Production Theory prioritises flow efficiency and argues that value should move through the system at the pace of customer demand (Womack & Jones, 1996). In manufacturing, this is operationalised through takt-time control and pull systems. However, in aviation catering, demand cannot be synchronised directly to production because final passenger numbers are not confirmed at the time of production (Chen & Hidalgo, 2021). This produces an irreconcilable contradiction with pull-based flow logic, making aviation catering an example where lean's foundational

demand synchronization principle cannot be applied in pure form. Scholars studying industrial catering argue that lean must be adapted to contexts where demand is probabilistic rather than deterministic (Vlachos, 2015), while others insist lean cannot be fully operationalised if uncertainty eliminates the ability to match flow and demand (Dora et al., 2016). This unresolved theoretical disagreement indicates that lean implementation in aviation catering must be selectively contextualised.

Lean also proposes the elimination of batch-based thinking and advocates single-piece flow (Womack & Jones, 2003). Yet in aviation catering, batch production is compulsory because meal assembly must be synchronised into sealed production cycles, airline menu identity must be preserved, and cold-chain dispatch must occur for entire flights simultaneously (Ross, 2014). Therefore, lean's anti-batch principle cannot be directly applied even if it theoretically yields waste reduction. This contradiction reveals the importance of combining lean with institutional theory in this thesis — lean explains 'how waste is structurally created inside the system,' while institutional theory explains 'why the system cannot remove it fully.' Lean alone cannot explain structural overproduction; institutional theory alone cannot explain inefficient flow amplification. Both lenses together allow multi-dimensional interpretation.

In addition, lean emphasises continuous improvement (Kaizen) where employees actively participate in identifying root causes of waste (Imai, 1986). Research in food service indicates Kaizen-based involvement improves awareness and waste detection (Gładysz et al., 2020) and enhances intra-organisational learning (Dora et al., 2016). However, institutional food production limits employee discretion because compliance requirements are non-negotiable (Mirosa et al., 2023). Therefore, lean participation-based waste elimination clashes with institutional hierarchies that restrict operator agency. Lean assumes workers' empowerment increases operational performance; institutional constraints assume hierarchical control prevents deviation risk. This tension demonstrates that lean's human resource premise may be less transferrable to aviation than to general hospitality (Mirosa et al., 2023). Thus, lean cannot directly infer that staff empowerment will lead to waste reduction in aviation catering unless institutional rules permit discretionary micro-adjustments.

Lean theory also presumes organisations seek internal efficiency alignment across production purpose, process and performance (Womack & Jones, 2003). Yet institutional scholars argue

alignment is not necessarily feasible when production goals are externally imposed (Scott, 2008). In aviation catering, production goals are partially controlled by airline stakeholders, equipment standards, regulatory surveillance and food safety doctrine (Chen & Hidalgo, 2021). Lean therefore faces boundary limitations in constrained institutional environments. Lean research in healthcare finds similar constraints where safety logic supersedes efficiency logic (Engström et al., 2022), and this parallel demonstrates theoretical convergence between healthcare and aviation catering as institutional-critical operational domains. Consequently, lean must be theoretically treated as secondary explanatory lens in aviation, it can explain process inefficiency consequences but cannot define institutional legitimacy logic.

Nevertheless, lean theory remains highly relevant because it offers structured conceptual categories to diagnose internal production waste patterns. Lean categorisations allow systematic mapping of where waste accumulates (Dora et al., 2016) and this is crucial for this study because aviation catering waste is not random, it is clustered inside particular production nodes such as portioning, assembly, packing and over-processing (Mirosa et al., 2023). Lean provides analytical framework to examine which production processes amplify waste once institutional buffers have already been set. Institutional theory tells us buffers are unavoidable; lean tells us where buffers are operationally magnified.

4. Methodology

This chapter outlines the methodological choices guiding this study, including the research approach, case study strategy, participant selection, data collection, and analysis procedures. These decisions directly support the aim and research questions by enabling an in-depth exploration of organisational reasoning and production practices. A qualitative single-case design was chosen to capture rich, context-bound insights that quantitative methods cannot provide.

4.1 Research Approach

A qualitative research approach was adopted as the most suitable strategy for exploring how responsible production practices are understood, enacted, and constrained within an aviation catering environment. Qualitative inquiry enables the researcher to access organisational meaning, institutional pressures, and production logics that cannot be captured through numerical measurement (Trost, 2010; Kvale & Brinkmann, 2015). Since this study aims to investigate *how* and *why* food waste emerges within a tightly regulated production system, qualitative methods provide the depth and contextual sensitivity required to examine complex organisational reasoning (Creswell & Poth, 2018). Institutional Theory further necessitates an interpretive approach because institutional logics, compliance pressures, and legitimacy concerns are embedded in actors' subjective interpretations rather than observable quantitative outputs. Similarly, Lean Production Theory requires an understanding of how employees rationalise operational decisions, buffer creation, and workflow choices, making qualitative access to practitioner reasoning essential. Quantitative methods would be insufficient for this study, as they cannot fully reveal tacit knowledge, informal routines, or sensemaking processes that shape production decisions.

In addition to two face-to-face interviews, written responses to the semi-structured interview guide were treated as legitimate qualitative elicitation tools, enabling participants to articulate detailed experiential accounts in their own words. Collectively, this approach supports the study's aim of developing an interpretive, rather than measurement-driven, understanding of responsible production within aviation catering.

The choice of a qualitative research approach is not only appropriate but necessary given the limitations identified in the literature review. Previous studies on food waste in aviation catering and institutional food service have relied heavily on quantitative measures of waste volumes,

disposal rates, or efficiency indicators. While such approaches document the scale of the problem, they reproduce the same analytical limitations identified in Chapter 2 by treating food waste as a measurable outcome rather than a socially and institutionally produced phenomenon. In aviation catering, key drivers of waste—such as regulatory compliance, safety margins, airline specifications, and risk-avoidance norms—cannot be directly measured or meaningfully captured through quantitative datasets. Waste is often normalised as part of routine operations and therefore remains invisible in formal records. Understanding why waste persists under these conditions requires access to actors' interpretations, justifications, and sense-making processes. A qualitative approach is therefore required to examine how responsibility, risk, and compliance are understood and enacted in daily production decisions, rather than assuming waste results from technical inefficiency alone.

4.2 Research Strategy

A single-case study strategy was adopted to enable an in-depth examination of responsible production practices within a highly regulated aviation catering environment. Case studies are particularly well suited to research questions framed around "how" and "why," as they allow the researcher to investigate real-world organisational behaviour within its natural context rather than through controlled or decontextualised measurement (Yin, 2018). This study asks how production decisions are shaped by institutional constraints and why certain waste-generating practices persist; therefore, a case study approach is methodologically coherent with these exploratory aims.

The selection of a single-case study design is directly informed by the findings of the literature review and the theoretical framing of this study. Institutional Theory emphasises that production practices are deeply embedded in specific regulatory, contractual, and organisational contexts. In aviation catering, waste-generation mechanisms are shaped by site-specific combinations of biosecurity regulation, airline requirements, workflow design, and organisational culture. A single embedded case allows these institutional dynamics to be examined in depth, capturing how formal rules and informal routines interact in practice. A comparative multi-case design was deliberately not adopted because comparison across different catering units or airports would risk flattening institutional complexity and shifting analytical attention toward surface-level similarities or differences. Given the study's aim to explain how waste is produced through internal decision-making under constraint, depth of understanding within one institutional setting offers greater

analytical value than breadth across multiple cases. The single-case design therefore strengthens, rather than limits, the study's ability to explain the causal mechanisms linking institutional pressure and responsible production.

Aviation catering constitutes a bounded, complex, and institutionally constrained setting where safety legislation, time-critical processing, and operational uncertainty interact to shape internal production choices. Such complexity cannot be meaningfully isolated from its context, making a case design more appropriate than experimental, survey-based, or cross-sectional methods. The single-case strategy is further justified by its alignment with situations Yin (2018) describes as warranting depth over breadth, namely when the case is revelatory, unique, critical, or under-researched. Aviation catering waste has been identified in prior literature as structurally different from hospitality or retail waste due to strict biosecurity regulations and mandatory disposal protocols, positioning this case as both unique and theoretically critical (Mirosa et al., 2023). Moreover, empirical research on production-stage behaviour inside airline catering facilities remains limited, reinforcing the under-researched justification (Eisenhardt, 1989).

The study follows an embedded case design, incorporating multiple actor levels, managers, supervisors, and operational staff, within one organisation. This allows examination of how different organisational roles interpret institutional pressures and operational challenges, providing richer insight into internal dynamics. By collecting data from individuals occupying different hierarchical and functional positions, the case generates internal triangulation, enabling the comparison of perspectives within a single organisational context (Andrews, 2021). This embedded logic also reflects Institutional Theory's emphasis on multi-level sensemaking and Lean Theory's concern with decision-making at practical workflow levels.

Importantly, a deliberate decision was made *not* to pursue a cross-company comparison. While multi-case designs can broaden generalisability, they risk sacrificing depth, one of the key criticisms raised in previous supervisory feedback. Focusing on a single organisation enables a more concentrated, context-sensitive investigation aligned with the aim and research questions, providing analytical richness rather than superficial breadth.

4.3 Selection of Participants

A purposive sampling strategy was adopted to identify participants with direct relevance to production processes and food-waste generation, ensuring that data collection targeted individuals capable of providing rich, experience-based insights (Campbell et al., 2020). Purposive sampling is well suited to qualitative case studies in operational environments because it allows the researcher to select participants based on specific knowledge, responsibilities, and involvement in the phenomenon under investigation (Kvale & Brinkmann, 2015). In this study, sampling decisions were guided by the requirement to capture multiple organisational viewpoints, reflecting the layered nature of production decision-making. Institutional Theory emphasises the importance of examining how actors at different hierarchical levels interpret organisational constraints, compliance pressures, and operational routines; therefore, incorporating respondents from varied organisational roles strengthens analytical depth and internal triangulation (Scott, 2008).

Participants were selected from across managerial, supervisory, and frontline operational roles to obtain a heterogeneous but contextually relevant sample. This diversity supports Lean Production Theory's concern with understanding on-the-ground workflow decisions as well as the institutional expectations shaping them. Eligibility required that participants were actively engaged in planning, executing, or overseeing production processes, inventory allocation, food preparation, portioning, or waste handling. Access to participants was negotiated through the organisation's production management, who facilitated contact with relevant personnel. Initial discussions clarified the research purpose, ethical safeguards, and data requirements, after which managers identified suitable candidates and introduced them to the researcher. Additional participants were recruited through internal referrals, a common approach in operational environments where organisational knowledge is distributed unevenly (Noy, 2008).

The final sample consisted of eight participants: two took part in face-to-face semi-structured interviews, while six provided written responses to the semi-structured interview guide. Although presented in written form, these six responses followed the same interview structure and were treated as qualitative narrative data. Table 1 summarises the participant characteristics.

Table 4.1 Participant Overview

Participant Code	**Role**	**Interview Type**	**Length (Minutes / Pages)**
A	Production Manager	Face-to-face interview	55 minutes
B	Sous-chef	Face-to-face interview	48 minutes
C	Assistant Production Manager	Written interview response	4 pages
D	Team Leader, Production	Written interview response	4 pages
E	Team Leader, Cold Kitchen	Written interview response	3 pages
F	General Worker, Hot Kitchen	Written interview response	2 pages
G	Chef, Menu Coordination	Written interview response	3 pages
H	General Worker, Waste Handling	Written interview response	2 pages

4.4 Designing the Interviews

4.4.1 Development of the Interview Guide

A semi-structured interview approach was used to balance structure with conversational flexibility, allowing participants to elaborate on experiences while enabling comparability across responses (Kvale & Brinkmann, 2015). The interview guide was developed directly from three foundational sources: the literature review, the theoretical framework, and the research questions. First, insights

from the literature concerning lean waste categories, institutional constraints, regulatory rigidity, and operational decision-making informed the conceptual boundaries of the guide. Second, Institutional Theory and Lean Production Theory both emphasise understanding *interpretations* and *reasoning* behind organisational behaviour; therefore, the guide was designed to elicit sensemaking rather than factual reporting. Third, the research questions—which seek to understand how responsible production is enacted and why food waste occurs—required open-ended prompts that could reveal reasoning, constraints, and practical realities.

To ensure thematic clarity, questions were organised into key areas aligned with the study's focus:

1. Production planning (e.g., portioning, demand forecasting, workflow design)
2. Buffer creation and decision-making under uncertainty
3. Regulatory constraints shaping production and disposal practices
4. Operational waste drivers across production stages
5. Opportunities and barriers for responsible production practices

This thematic grouping aligns with the interpretivist orientation of the study, supporting exploration of subjective interpretations and institutional rationalities. Importantly, the same interview guide was provided to the six participants who submitted written responses, ensuring consistency and comparability across all eight interviews regardless of delivery mode. The complete interview guide can be found in Appendix A.

4.4.2 Preparation for Interviews

Effective interview preparation was essential to ensure credibility, sensitivity, and contextual accuracy. Prior to conducting interviews, the researcher familiarised themselves with the organisation's production workflow, menu structures, portioning standards, and relevant regulatory frameworks governing aviation catering. Such preparation allows the interviewer to understand contextual nuances and ask informed follow-up questions, enhancing the depth of qualitative insights (Trost, 2010).

Participants were provided with an information sheet outlining the study's purpose, their rights, and confidentiality assurances. This ensured transparency and allowed interviewees to reflect on

the themes in advance. Prior to each interview, the researcher reiterated ethical measures, including anonymity and voluntary participation, to create a comfortable environment that encouraged honest and reflective responses. This preparation strengthened rapport and supported the interpretivist aim of capturing authentic organisational perspectives.

4.5 Collecting and Processing the Data

4.5.1 Conducting the Interviews

The data collection process consisted of two modes of interviewing: face-to-face semi-structured interviews and written semi-structured responses. Two interviews were conducted in person at the production facility, allowing the researcher to engage directly with participants in their operational environment. These interviews were audio-recorded with explicit consent to ensure accuracy and to avoid reliance on memory, which can distort meaning (Kvale & Brinkmann, 2015). Recording also enabled the interviewer to focus fully on the conversation rather than note-taking, supporting an open and natural dialogue. To minimise distraction and maintain rapport, detailed notes were written immediately after each interview rather than during the conversation, consistent with recommendations by Trost (2010).

The remaining six participants completed the same semi-structured interview guide in written form. These written responses were treated as asynchronous semi-structured interviews rather than surveys, as participants provided narrative explanations aligned with qualitative elicitation logic. Written interviews allowed respondents, particularly those with time constraints—to reflect more carefully on complex operational and regulatory issues.

Interviews were conducted over a two-week period during regular shift schedules, ensuring that participants' insights reflected active engagement with daily production routines. While face-to-face interviews facilitated spontaneous probing and clarification, written interviews may limit follow-up depth. However, written responses often provided more considered reflections, particularly regarding regulatory barriers and structural constraints. The combination of both formats therefore enriched the dataset with diverse forms of expression while maintaining conceptual comparability across all eight participants.

4.5.2 Processing the Data

Data processing involved converting oral and written accounts into a unified textual corpus. Face-to-face interviews were transcribed verbatim immediately after recording, ensuring that nuances, hesitations, and emphases were preserved as closely as possible (Kvale, 2008). Written interview responses were integrated directly into the dataset without modification, treated as primary qualitative material equivalent in analytical status to transcribed interviews.

The study employed an abductive analytical orientation, meaning that analysis moved iteratively between empirical data and the theoretical framework (Timmermans & Tavory, 2012). Abduction is particularly appropriate for institutional and operational research, as it allows emerging insights to refine and challenge theoretical expectations. This approach enabled the researcher to identify how participants' accounts confirmed, complicated, or extended theoretical concepts such as institutional pressures, operational decision logics, buffer creation, or lean-aligned waste interpretations.

Throughout this process, emphasis was placed on interpretive meaning-making rather than linguistic form. Each transcript and written response was read multiple times to capture underlying rationales, institutional explanations, and contextualised operational practices. This integrated dataset provided a rich foundation for subsequent coding and thematic development, ensuring alignment with the study's interpretivist and theory-informed aims.

4.6 Data Analysis

The data were analysed using a thematic content-analytic approach, which is well suited to identifying patterned meanings across qualitative material while remaining grounded in participants' own accounts (Kvale, 2008; Braun & Clarke, 2006). Consistent with the study's interpretivist orientation, the analysis focused on how participants explained production decisions, buffers, constraints, and waste generation, rather than on counting codes or producing frequencies (Creswell & Poth, 2018). This approach ensures that empirical material is interpreted in direct relation to the literature review and theoretical framework, rather than treated as descriptive reporting of operational practices.

The coding strategy followed an abductive and theory-informed logic, moving iteratively between empirical data and theoretical concepts. Institutional Theory and Lean Production Theory

functioned as sensitising lenses rather than as a fixed coding template (Scott, 2008; Womack & Jones, 1996; Timmermans & Tavory, 2012). In line with this approach, the analysis was explicitly oriented toward identifying three interrelated analytical dimensions derived from the literature review: institutional pressures (e.g., regulatory compliance, airline specifications, safety norms), lean-related operational inefficiencies (e.g., buffer accumulation, workflow fragmentation, feedback gaps), and hybrid tensions where institutional logics interact with or override lean optimisation principles. These dimensions guided how themes were developed, labelled, and presented in the results chapter, ensuring clear correspondence between the analytical approach and the empirical findings.

Practically, the analysis proceeded through five iterative steps. First, familiarisation involved multiple readings of interview transcripts and written responses to identify recurring expressions related to regulation, safety, forecasting buffers, short-notice changes, workflow coordination, and waste (Kvale, 2008; Trost, 2010). Second, open coding was conducted line by line, remaining close to participants' language and assigning descriptive codes such as "overproduction to avoid complaints," "regulation overrides reuse," "buffer added due to uncertainty," and "waste not tracked by cause" (Braun & Clarke, 2006; Campbell et al., 2013).

Third, these initial codes were grouped into more abstract categories aligned with the theoretical lenses. Institutional Theory informed categories such as coercive regulatory pressure, normative food-safety culture, and mimetic alignment with airline requirements, while Lean Production Theory informed categories including planned overproduction, disrupted flow, duplication across stages, and defects treated as operationally normal (Scott, 2008; Liker, 2004; King & Lenox, 2001). At the same time, the abductive approach allowed categories to emerge where theory offered limited guidance, such as emotional discomfort among staff when discarding edible food, informal workarounds, and tensions between compliance and professional judgement (Evans, 2012; Engström et al., 2022). This ensured that theory guided, but did not predetermine, the analytical structure.

Fourth, theme development involved integrating these categories into higher-level themes explicitly linked to the research questions and clearly labelled to reflect whether they represented institutional pressures, lean inefficiencies, or their interaction. For RQ1, themes captured how responsible production is interpreted and enacted within institutional constraints, including

responsibility framed as regulatory compliance, service reliability, and internal resource stewardship (Lo et al., 2012; Papargyropoulou et al., 2014; Goonan et al., 2014). For RQ2, themes focused on the interaction between institutional pressures and lean logics, capturing tensions such as lean ideals versus risk-averse buffers and waste visibility versus KPI-driven blind spots (Dora et al., 2016; Gładysz et al., 2020; Marthinsen et al., 2012). All themes were reviewed against the full dataset to ensure they reflected recurrent and structurally embedded patterns rather than isolated anecdotes (Braun & Clarke, 2006).

Finally, theory-linked interpretation involved systematically reading each theme through the combined lenses of Institutional Theory and Lean Production Theory. For example, decisions to maintain significant overproduction buffers were interpreted as the outcome of coercive regulatory requirements and reputational risk management (Institutional Theory) interacting with a constrained application of lean principles that prioritises service continuity over strict waste minimization (Womack & Jones, 1996; Akkerman et al., 2010; Chen & Hidalgo, 2021). Cross-role comparisons between managers, supervisors, and frontline staff were used to identify convergences and divergences in how institutional pressures, operational constraints, and responsibility for waste were perceived and rationalized (Eisenhardt, 1989; Andrews, 2021). This explicit and iterative movement between data, theory, and research questions ensures that the analysis is tightly integrated with the conceptual foundations established in earlier chapters and directly addresses the supervisor's concern regarding alignment between analytical approach and empirical thematization.

4.7 Ethical Considerations

Ethical integrity guided all stages of this study, reflecting the sensitivity of aviation catering, strict food-safety regulation, and organisational confidentiality. Interviews were conducted only after informed consent, with participants clearly briefed on the study purpose, voluntary nature of participation, and their right to withdraw at any time. Consent was obtained verbally and in writing for face-to-face interviews, and through written acknowledgement for those completing written guides. No incentives were offered and management involvement was limited to granting organisational access, reducing risks of coercion for operational staff. Confidentiality and anonymity were rigorously protected. Participants were reported only using codes (A–H), and

potentially identifying details or security-sensitive operational information were excluded. The study complied with GDPR: no personal identifiers were retained, and all data were stored on encrypted, password-protected drives for academic use only. Audio-recording was employed solely with explicit permission and justified as necessary to ensure accurate transcription; recordings were deleted after verification. Finally, care was taken to protect employees from organisational risk. As interviews sometimes addressed waste practices, compliance gaps, and operational challenges, findings were presented only in aggregated form to avoid attributing criticism or sensitive information to individual staff members or specific roles.

4.8 Trustworthiness of the Study

Because this research adopts a qualitative case study design, the traditional concepts of *validity* and *reliability* used in quantitative research are not directly applicable. Instead, the study's rigour is evaluated using Lincoln and Guba's (1985) framework of *trustworthiness*, which comprises credibility, transferability, dependability, and confirmability. These criteria ensure methodological robustness while aligning with the interpretive nature of qualitative inquiry.

4.8.1 Credibility

Credibility refers to the extent to which the findings accurately represent participants' realities. This study enhances credibility through a multi-role sample, incorporating perspectives from managers, supervisors, chefs, and operational staff, allowing the research to capture institutional, managerial, and frontline interpretations of production and waste practices. Such variation strengthens insight into organisational logics and institutional pressures (Kvale & Brinkmann, 2015).

Credibility is further reinforced through a form of data triangulation, achieved by combining two types of qualitative elicitation:

1. Face-to-face, audio-recorded interviews, and
2. Written interview-guided responses from participants who preferred asynchronous completion.

Although the study does not employ full methodological triangulation (e.g., observations, documents), the combination of oral and written data still helps reduce single-method bias and capture richer forms of meaning. Participants were also given the opportunity for informal member reflection, whereby clarifications were welcomed during and after data collection. While not full member checking, this process allowed participants to refine or elaborate on points, contributing to interpretive accuracy.

4.8.2 Transferability

Transferability concerns the extent to which findings can be meaningfully applied to other contexts. This study strengthens transferability by providing thick description of the organisational setting, regulatory constraints, production environment, and institutional pressures shaping waste practices (Lincoln & Guba, 1985). By clearly outlining contextual boundaries—e.g., EU aviation waste regulations, batch-standardised production systems, and role-specific responsibilities—the study equips readers to judge whether findings may apply to similar high-regulation industrial catering environments.

Rather than claiming universal generalisation, the research offers analytical generalisation (Yin, 2018), enabling the theoretical insights on institutional constraints and responsible production to inform comparable settings.

4.8.3 Dependability

Dependability refers to the stability and transparency of the research process. This study enhances dependability by maintaining a clear, systematic, and transparent methodological process. Each step, sampling, recruitment, interview design, data collection, coding, and analysis, has been explicitly documented and justified using academic literature (e.g., Kvale, 2008; Trost, 2010; Braun & Clarke, 2006).

A structured audit-like research binder was maintained, containing:

• recruitment emails,

• interview guides,

• anonymised transcripts,

• coding notes,

• data management logs.

This ensures that future researchers could replicate the procedural steps, even if the exact findings would inevitably differ due to the interpretive, time-sensitive nature of qualitative research. Dependability is strengthened by this transparency rather than by statistical reliability tests, which are inappropriate for qualitative meaning-making.

4.8.4 Confirmability

Confirmability ensures that findings originate from participants' accounts rather than researcher bias. This study enhances confirmability through:

• a maintained audit trail, documenting all major analytical decisions, coding changes, theme development, and theoretical integration, allowing external scrutiny of how interpretations were formed;
• reflexive awareness, where the researcher consistently reflected on their own assumptions, expectations, and positionality. Notes were recorded after each interview session to separate participants' voices from the researcher's interpretations, especially important in a single-case organisational study.

No preconceived model was imposed deductively; instead, themes emerged through an abductive, iterative dialogue between data and theoretical frameworks (Timmermans & Tavory, 2012). This supports neutrality and analytic transparency.

4.9 Methodological Limitations

Although eight participants contributed to this study, only two interviews were conducted face-to-face, limiting the depth and nuance normally gained through dialogic interaction. The remaining six written-response interviews provided valuable insight but did not allow probing or clarification,

leading to more surface-level explanations. The study also lacked observational or documentary data due to strict hygiene, security, and biosecurity regulations in aviation catering, preventing verification of practice–policy gaps and restricting analysis of tacit or embodied behaviours. As a single-case study, findings are context-specific and cannot be statistically generalised, relying instead on analytical generalisation with its inherent interpretive limitations. Time, access, and operational pressures further shaped the sample, limiting participation from roles such as night-shift planners or quality assurance staff. Lastly, the organisational sensitivity of aviation operations, especially concerning safety and regulatory compliance, may have constrained participants' openness, with some potentially hesitant to discuss internal problems or non-ideal practices.

5. Results

This chapter presents the empirical findings of the study, which explores how current production practices generate food waste and how responsible production can be strengthened within aviation catering at Newrest Arlanda (RQ1 and RQ2). Drawing on interviews with eight participants across management, supervisory, and frontline roles, the chapter is organised into four main parts: general contextual observations, results addressing RQ1, results addressing RQ2, and a brief cross-cutting synthesis linking operational routines with institutional and regulatory logics.

5.1 General Observations

Across all eight interviews, participants consistently described food waste as both a recognised operational problem and an unavoidable element of aviation catering. Managers (A, C, G) repeatedly framed waste as a structural outcome of regulation, safety standards, and fluctuating airline requirements, while frontline staff, particularly the General Worker, Hot Kitchen (F) and General Worker, Waste Handling (H), spoke more emotionally about the experience of discarding edible food. As one staff member explained, *"When you spend hours preparing trays and then see full containers going straight into the waste bin, it feels wrong because you know nothing is actually spoiled, but we still cannot use it."* This emotional tension contrasts with managerial accounts that emphasise compliance obligations.

All participants also expressed a strong and shared understanding of the institutional constraints that shape their daily work. Strict food-safety rules, aviation biosecurity legislation, and the legally prohibited reuse or donation of Category 1 waste were referred to as immovable boundaries rather than company-level choices. Staff across departments repeatedly mentioned tight production windows, unpredictable airline changes, and high passenger variability as reinforcing these limits. As one manager summarised, *"Even when we want to reduce waste, there are rules we absolutely cannot compromise, temperature controls, untouched food disposal, sealed-unit requirements, and aviation hygiene laws create a system where some waste is unavoidable, no matter the efficiency of the team."*

Participants also pointed out that experiences of waste differ considerably between departments. Hot kitchen staff face batch-size and yield variability; cold kitchen staff struggle with portion standardisation; tray assembly staff deal with last-minute airline changes; planners face forecasting

uncertainty; and dispatch staff confront the final volume of rejected or returned meals. These variations shape how each group interprets waste, constraints, and opportunities for improvement. This departmental differentiation forms the basis for the thematic analysis presented in the subsequent sections.

5.2 RQ1 – How Current Production Practices and Routines Contribute to Food Waste

This section addresses Research Question 1, examining how existing production routines, decision-making logics, and operational structures at Newrest Arlanda contribute to food waste. Analysis of the eight interviews revealed five dominant themes spanning planning, kitchen production, assembly routines, regulatory constraints, and end-of-line waste handling. These themes emerge consistently across management, supervisory, and frontline roles, though each group experiences them differently.

The themes are presented through an abductive, theory-informed lens, drawing on Institutional Theory and Lean production principles. Each theme reflects either (1) institutional pressures shaping production decisions, (2) lean inefficiencies within operational workflows, or (3) the interaction between these two forces.

5.2.1 Institutionalised Overproduction through Forecasting and Safety Buffers

This theme primarily reflects institutional pressure, where airline service expectations, contractual obligations, and risk-avoidance norms shape forecasting decisions and normalise overproduction. Across all planning-related interviews (G, A, C, B), forecasting and menu planning appear as primary structural drivers of overproduction. Despite increasing access to airline data, the system requires mandatory safety margins, which normalise overproduction. Planners, managers, and chefs all described buffers not as optional decisions but as institutionalised requirements embedded in the business model.

Participants repeatedly explained that uncertainties, such as last-minute passenger load changes, unexpected special meal requests, aircraft swaps, or airline-specific service policies, force the production team to prepare more trays than projected demand. Chef, Menu Coordination (G) clarified that even accurate forecasting cannot eliminate these mandated buffers:

"*Even if our data shows that a flight will likely depart with fewer passengers, we still have to produce a higher number of trays because airlines expect us to cover last-minute check-ins,*

upgraded passengers, and special meals. The cost of missing one meal is seen as much more serious than producing ten extras."

Managers (A, C) confirmed that the company systematically prioritises avoiding shortages over preventing waste. Assistant Production Manager (C) explicitly acknowledged the operational logic:

"*We are all aware that we overproduce in certain cycles, but the system is designed that way. A shortage creates service failure for the airline, so the acceptable risk always leans towards having extra meals rather than running too tight*."

Line level staff (B, F) recognised the same pattern, noting that planned buffers often exceed what is needed on low-load days. Meanwhile, planners (G) described their forecasting tools as helpful but insufficient, because airlines do not always supply real-time data, compelling reliance on internal "rule-of-thumb" patterns.

Across interviews, it became clear that forecasting accuracy is not the main issue, institutional expectations for redundancy are. Thus, waste is structurally embedded at the planning stage through required safety margins, not individual misjudgement.

5.2.2 Risk-Avoidant Portioning and Comfort Buffers at the Production–Assembly Interface

This theme illustrates a hybrid tension between lean production principles and institutional risk logics, where standardisation and flow efficiency are undermined by psychological safety concerns and service compliance pressures. Team leaders and general workers (D, E, F) consistently described how fixed component counts and strict visual standards lead to structural surplus. Team Leader, Production (D) emphasised that trays must appear uniformly filled, with no visual gaps, which forces the preparation of excess components:

"*Every tray has to look identical, perfectly filled, and visually balanced. That means we prepare more components than the exact count because if anything runs short halfway through an assembly run, we cannot stop the line and wait. So, we always keep extra pans ready 'just in case', and whatever is left at the end cannot be reused*."

Team Leader, Cold Kitchen (E) echoed this, adding that staff often over-portion because they fear quality complaints from airlines, describing a tendency toward what she called "comfort waste", extra production that makes employees feel safe against unexpected changes:

"*People add a bit more than the recipe says or fill an extra tray because they don't want to get stuck or be the one who delays the line. It's comfort waste, nobody wants to take the risk of hearing that the tray looked empty or that we ran short, so they protect themselves by producing too much.*"

Frontline staff internalise the same pressures. General Worker, Hot Kitchen (F) explained how fear of shortage leads to defensive behaviour:

"*If my batch finishes too early everyone looks at me like it's my fault, so honestly, I would rather make a bit extra to be safe. It's better to have leftovers than be blamed for running out."*

These narratives highlight a tension between formal lean principles (precision, flow, minimising waste) and actual worker behaviour, where psychological safety and risk avoidance drive overproduction. The outcome is predictable: structural "comfort buffers" at nearly every stage, normalised as part of routine production.

5.2.3 Lean Flow Breakdowns Amplified by Institutional Segmentation

This theme reflects lean inefficiencies that are intensified by institutional segmentation, where departmental silos and compliance-driven handovers disrupt flow and create structural waste. The aviation catering workflow flows sequentially through hot kitchen → blast chilling → cold kitchen → tray assembly → holding → dispatch. Managers and supervisors highlighted that each handover introduces new risks: miscounts, timing mismatches, incomplete information, temperature-loss windows, and duplicated batches.

Production Manager (A) offered a comprehensive description of how these disconnects produce avoidable waste:

"From hot production to chilling, from chilling to cold kitchen, from there to the assembly line, and finally to dispatch—every step has its own team, its own timing, and its own rush. If any one number is wrong or delayed, someone compensates by producing extra. By the time we reach

dispatch and see the full picture, we sometimes realise two departments made extra batches because they didn't have the same information in the moment."

Assistant Production Manager (C) reinforced this systemic issue by noting that no single person controls the entire flow, making waste an emergent outcome rather than an individual error:

"The waste often happens in the gaps. One team thinks the other team under-produced so they add a buffer, or a miscommunication about passenger numbers leads to doubling a batch. It's not intentional—it's the structure of the workflow that creates these mismatches."

Waste-handling staff experience the final stage of this fragmentation. Participant H explained that once trays arrive at dispatch, surplus cannot re-enter the production cycle, even if discovered before uplift:

"*Sometimes we receive more trays than ordered, but at that point we cannot send anything back. Everything is sealed, counted, and logged. Even if we notice there are extra meals, they move straight to the waste bins because the airline paperwork is already completed."*

This illustrates that fragmentation, handover misalignments, and operational silos create systemic, structural waste that cannot be corrected once it reaches later stages of the process.

5.2.4 Coercive Institutional Constraints and Non-Negotiable Waste

This theme is dominated by coercive institutional pressures, where regulatory compliance and biosecurity rules define the non-negotiable boundaries of responsible production. This theme concerns the strict regulatory environment that governs aviation catering, where EU Category 1 rules, temperature requirements, seal-integrity controls, and traceability demands mean that any deviation, however small, results in immediate disposal. Across all roles, participants emphasised that many waste outcomes cannot be changed locally because they stem from coercive institutional constraints rather than operational choices.

Sous-chef (B) described this vividly, noting that even visually perfect food must be discarded if any compliance parameter is not met:

"*There are days when the food looks absolutely fine, and honestly you would eat it yourself with no hesitation, but if the documentation doesn't match or if the temperature dropped even once*

during transfer, we cannot use it. The rule is automatic: if the chain of control is broken at any point, the whole batch is thrown out whether it looks perfect or not."

Staff repeatedly highlighted that these rules feel "above us", reflecting strong coercive institutional pressure. The desire to save good food often collides with rigid compliance requirements. Waste-handling staff reinforced this frustration. H explained the consequences when sealed trolleys return from aircraft:

"*When sealed trolleys come back, even if everything inside is untouched and still cold, we must throw it straight away. We cannot open the seal and reuse anything. Once it leaves the building, it's no longer allowed to re-enter the system, so the whole trolley goes to waste*."

Participants consistently reported that regulatory waste is not perceived as a result of poor practices but as a non-negotiable structural condition, shaping the limits of what responsible production can realistically achieve within aviation catering.

5.2.5 Institutionalised Invisibility of Waste through Measurement and Reporting Gaps

This theme reflects an institutional mechanism of invisibility, where waste persists because measurement systems prioritise compliance over learning and continuous improvement. While some waste-tracking systems exist, bin logs, weight logs, dispatch summaries, participants described them as administrative records rather than active learning tools. Managers (A, C, G) highlighted that the organisation lacks a holistic system linking waste data to forecasting, production planning, or menu adjustments.

Assistant Production Manager (C) summarised the issue:

"*We do log our waste, but we don't really sit down and connect it to planning decisions. The numbers get recorded, sometimes weighed, sometimes categorised, but they don't feed back into forecasting in a structured way. It becomes more of a compliance routine than something we use to change how we produce."*

Chef, Menu Coordination (G) also noted that waste data is often too aggregated to be actionable:

"*What we get back is often just total kilograms or broad categories. It doesn't tell you whether the problem came from portioning, assembly errors, or demand fluctuations. Without that level of detail, it's hard to know what exactly needs fixing*."

Waste-handling staff confirmed this disconnect. H explained that the data they collect rarely returns to them in any meaningful form:

"We weigh everything and write down the bin codes, but after that we never hear what happens with the numbers. Nobody comes back to say what it meant or if something changed because of it."

These data gaps create pockets of invisible waste, losses that are neither fully tracked nor meaningfully analysed, limiting the organisation's ability to use evidence to challenge existing production norms. The result is a cycle where structural waste patterns persist because the system records waste but does not learn from it.

5.3 RQ2 – Opportunities to Improve Responsible Production Practices

The improvement opportunities identified by participants reflect both lean-oriented operational refinements and broader institutional constraints. While several suggestions align with lean principles such as flow improvement, feedback loops, and waste visibility, their feasibility is shaped by contractual, regulatory, and organisational structures beyond the control of frontline staff. This section addresses RQ2 by examining how employees across different roles envision strengthening responsible production within the unavoidable institutional constraints described earlier. Participants did not imagine radical system change, since aviation regulations, temperature requirements, and airline specifications remain non-negotiable, but instead described practical, operationally grounded improvements that could reduce avoidable waste, tighten processes, and enhance organisational learning. Their insights highlight both the potential for improvement and the limits imposed by the aviation catering environment.

5.3.1 Existing Waste-Reduction Practices and Their Limits

Across departments, staff described a number of existing practices aimed at reducing preventable waste, including batch cooking, just-in-time finishing, recipe optimisation, standard operating

procedures, and limited internal reuse (e.g., staff meals where permitted). Hot kitchen and cold kitchen staff noted that tighter control of batch sizes, improved portioning tools, and structured workflow sequencing already help minimise unnecessary overproduction. Supervisors emphasised that these strategies work best when airline orders are stable and when time pressures do not force shortcuts.

Sous-chef (B) offered an example of a successful refinement initiative:

"*One thing that really helped was adjusting the garnish and batch quantities for certain dishes. Instead of making everything in huge standard pans, we broke the batches into smaller units so we could stop earlier if we saw that the numbers didn't match. It reduced the amount we had to throw away at the end, and because it didn't affect the airline's presentation standards, it was something we were actually able to implement without conflict."*

Team Leader, Cold Kitchen (E) similarly described improvements through small adjustments to assembly components and recipe quantities:

"*We realised that the salads were producing a lot of leftovers because the original recipe assumed a full tray run every time, so we rewrote the recipe to allow half-batches and flexible portions. It sounds simple, but it made a noticeable difference and worked because we didn't have to break any regulations or airline rules to do it."*

Yet, participants also stressed that many of these positive initiatives plateau because they cannot address underlying upstream waste drivers such as fluctuating passenger loads, Category 1 waste rules, and full compliance with airline specifications.

General Worker, Hot Kitchen (F) expressed this limitation clearly:

"*We can do small fixes like making smaller batches or trying not to overfill, and it helps a bit, but it doesn't change the bigger problem. The numbers come from planning, and if the order is too high, everything we do in the kitchen can only reduce a little. Most waste is decided before we even start cooking*."

Similarly, waste-handling staff highlighted that "downstream control" has limited impact when upstream production volumes are already locked in. As H noted:

"*We can sort it better or record it better, but by the time it reaches us, the waste is already created. We only see the result of decisions made hours earlier, so the real solution has to be in planning and production, not at dispatch*."

Together, these reflections demonstrate that while several waste-reduction practices already exist and are functioning effectively within their boundaries, their impact is often constrained by higher-level institutional requirements and planning systems. This points toward opportunities for strengthening responsible production through better alignment between planning, production, and departmental communication, developed further in the following subsections of RQ2.

5.3.2 Planning-stage Institutional Levers

Participants across planning and management roles emphasised that the root of responsible production lies upstream, well before food enters the kitchen. Planners (G), managers (A, C), and chefs (B) consistently argued that waste cannot be meaningfully reduced if the menu structure, forecasting logic, and airline specifications already mandate rigid volumes and non-negotiable components. Thus, several participants proposed interventions at the planning stage that could structurally reduce waste while staying within regulatory boundaries.

A central theme was the need for simpler menus, particularly for short-haul flights and low-margin routes, where variety generates disproportionate waste because even minor fluctuations make precise production difficult. Chef, Menu Coordination (G) repeatedly highlighted that the complexity of certain menu cycles "builds waste into the system" by design:

"When a menu has too many components or too much variation, we lose the ability to adjust anything in real time. If we could design menus that are more modular, like interchangeable elements that still meet the airline branding, we could react to passenger numbers without having to throw away a whole set of finished trays. The structure of the menu decides most of the waste before anyone in the kitchen has even touched a pan."

Participants also recommended more flexible 'equivalent item' policies allowing substitutions within agreed categories. Assistant Production Manager (C) explained that many airlines specify exact items to the point where even visually or nutritionally identical alternatives cannot be used:

"*We often have food ready that could easily replace another component, but the client spec is rigid. Even if the passenger wouldn't notice, we have to stick exactly to what was agreed. That removes our ability to adjust production when we see something change during the shift."*

Manager (A) reinforced this, noting that while planning has improved with better order histories, the system still treats any variation as a risk event:

"*Even when the data clearly suggests that a flight will go out with fewer passengers, we're not allowed to reduce quantities unless the airline signs off. So we keep producing the higher number because the risk of shortage is considered worse than the certainty of waste.*"

Several participants, especially G and C, suggested shorter menu-planning cycles, closer integration of historical uplift data, and revisiting standard buffer rules with airlines. These proposals underscore that responsible production is not only an operational issue—it depends on structural redesign at the planning stage, aligned with both institutional constraints and actual demand patterns.

5.3.3 Lean Flow and Coordination

Beyond planning, participants identified a range of operational opportunities to strengthen responsible production by smoothing interdepartmental communication, reducing unnecessary duplication, and creating faster feedback loops. These suggestions reflect intuitive lean production thinking, standard work, problem visibility, and root-cause focus—even when participants did not explicitly use lean terminology.

A consistent theme across hot kitchen, cold kitchen, tray assembly, and production management roles was the need for better synchronisation between departments. Participants described situations where misaligned information between hot kitchen, cold kitchen, and assembly led to duplicate batches being produced, trays prepared for the wrong quantities, or items arriving at assembly without matching counts.

Team Leader, Production (D) provided a vivid example:

"There was a day when the cold kitchen sent us components for 420 trays while the hot kitchen produced for 380. Nobody realised it until we started loading the line. We had 40 trays' worth of

cold items with no matching hot meal. If we had a clearer handover point, like a final confirmation before trays are started, that entire batch wouldn't have gone to waste."

Team Leader, Cold Kitchen (E) similarly explained how seemingly small communication gaps accumulate into large waste volumes:

"If someone updates the count in hot kitchen but doesn't tell us on time, we will already have prepped all the salads. It only takes one missed message for 20, 30, 40 portions to end up in the waste bin. A simple visual signal or shared board could stop this, because right now each department is trying to 'protect' itself by doing extra."

General Worker, Hot Kitchen (F) offered a practical operational suggestion rooted in day-to-day experience and informal pattern recognition:

"*Sometimes we see early in the shift that the numbers aren't realistic, like the pans coming back half full every day. If we could adjust the next batch right away, even a little bit, it would help. But because nobody wants to make the wrong call, we just keep following the number even when we know it's too high."*

These examples illustrate staff desire for short, real-time feedback loops allowing small adjustments, such as reducing a batch size or stopping a component early, without requiring bureaucratic approval. Participants also proposed visual controls (shared screens, colour-coded boards, automated count synchronisation) to ensure all teams work from the same live numbers, preventing the "parallel production streams" that currently generate systematic waste.

5.3.4 Staff Engagement, Training and Ownership of Waste

Across frontline and supervisory roles, participants emphasised that while staff *care* about waste and often feel personally affected by it, their training and involvement remain limited. Much of the current training is compliance-oriented, focused on hygiene, temperature control, and safety procedures, rather than explaining why waste matters, how waste connects to planning decisions, or how staff actions downstream influence upstream production. As a result, several participants described a gap between emotional concern and practical agency.

General workers (F, H) expressed that they learn about waste mainly through daily routines, informal instructions, and observing what supervisors prioritise. Waste is seen every day, but its causes are rarely discussed with them in a structured way. As one dispatch staff member put it:

"We throw away so much food, and honestly it doesn't feel good. I always think there must be something we can change because nobody likes putting whole trays or sealed meals straight into the bin. But we're never really told how we can prevent it, just that it has to be done and to follow the rules. Sometimes I wish someone explained the bigger picture, because we only see the end of it."

Supervisors agreed that although staff show strong emotional engagement, they often lack formal support or feedback to turn that engagement into meaningful action. Team Leader, Cold Kitchen (E) remarked that current procedures leave staff with responsibility but not much empowerment:

"People here want to do the right thing, they ask questions, they try to save things, but unless they understand why waste happens or have a chance to talk about patterns, they can't influence much. If we had regular briefings, simple dashboards, or even weekly feedback on what categories went up or down, I think the whole team would feel more involved and more confident to act instead of just following instructions."

Participants suggested practical improvements:

• visual dashboards showing daily or weekly waste trends,

• short team briefings to discuss waste incidents,

• recognising teams who reduce avoidable waste,

• incorporating waste-awareness into onboarding and refresher training.

These ideas highlight a shared belief that responsible production depends on staff ownership, and that ownership develops when staff understand both the constraints and the spaces where their actions matter.

5.3.5 Institutional-Level Change

While participants identified many operational improvements, they also stressed that major reductions in food waste require changes beyond their immediate authority. Managers and planners (A, C, G) repeatedly emphasised that aviation catering operates within an institutional structure composed of airline contracts, rigid service specifications, safety standards, and regulatory interpretations. Without adjustments at these higher levels, operational efficiencies can reduce *some* waste but cannot address the structural drivers.

Production Manager (A) was particularly clear that meaningful, long-term improvements require collaborative redesign of service concepts and production rules:

"If we could actually sit at the same table with the airline planners, procurement teams and the safety regulators all at once, we could redesign the whole system so it's safer and produces less waste. Right now, every rule comes from a different direction, the airline's marketing team, the operations team, the safety audits, so we're forced to work with contradictions. The kitchen can only optimise so much when the basic structure still pushes us to overproduce."

Participants also discussed the need to negotiate more flexible portioning rules, adjust safety margins within legal boundaries, or develop joint standards that allow substitution between components. Chef, Menu Coordination (G) emphasised that current contracts often lock the caterer into fixed specifications that ignore real-world variability. She noted:

"There's a limit to what we can change ourselves. We can make smarter menus, yes, but some requirements are fixed because they're written into airline policies that won't change quickly. So any big reduction in waste depends on whether clients are willing to rethink their service ideas or accept some flexibility. It's possible, but it will take time and cooperation."

Chefs and supervisors echoed this caution, arguing that while local improvements can reduce operational inefficiencies, they cannot eliminate the systemic waste caused by mandatory buffers, non-negotiable specs, and the inability to reuse returned food.

Together, these reflections show that staff recognise two tiers of responsible production:

1. Operational improvements they can influence internally (coordination, portioning, communication).

2. Institutional and structural levers, contracts, regulations, safety interpretations, that require negotiation and system-wide redesign.

This distinction underscores that while frontline and mid-level initiatives matter, major waste reduction requires upstream changes across the broader aviation catering ecosystem.

5.4 Summary of Key Findings

The findings addressing RQ1 show that food waste at Newrest Arlanda is generated through a set of interconnected production practices that are shaped by both institutional requirements and operational routines. At the planning stage, forecasting buffers, rigid airline specifications, and fixed portioning standards create built-in overproduction that cannot be adjusted in real time. These practices reflect institutional priorities that favour service reliability and compliance over waste minimisation. During execution, fragmented workflows across the hot kitchen, cold kitchen, tray assembly, and dispatch further contribute to waste by creating handover mismatches, duplicated buffers, and delayed visibility of surplus. In addition, strict food-safety and aviation regulations transform even minor deviations in temperature, documentation, or timing into compulsory disposal, reinforcing the structural nature of waste. Together, these findings indicate that food waste is not caused by individual mistakes, but is embedded within the production system itself.

In relation to RQ2, participants identified several opportunities to strengthen responsible production within these constraints. At the planning level, they highlighted the potential of simpler and more modular menus, improved forecasting logic, and greater flexibility in airline specifications to reduce built-in overproduction. At the operational level, improved cross-department communication, clearer handover points, and leaner workflow coordination were seen as practical ways to prevent unnecessary duplication and surplus. Participants also emphasised the importance of staff training, feedback, and engagement in building greater awareness and ownership of waste. However, they acknowledged that while these measures can reduce avoidable waste, their impact remains limited when upstream production volumes are already locked in by institutional requirements.

Taken together, the findings demonstrate that food waste at Newrest Arlanda emerges from the interaction between institutional pressures and lean inefficiencies. Institutional forces such as

airline contracts, safety regulations, and compliance norms embed overproduction at the planning stage, while lean breakdowns in flow, coordination, and feedback loops amplify waste during production and assembly. This confirms that food waste in aviation catering is an emergent system-level outcome, where institutional logics frequently override lean optimisation efforts, rather than a problem that can be solved through isolated operational improvements alone.

6. Discussion

This chapter critically discusses how the findings address the aim of exploring how responsible production practices can minimise food waste in aviation catering at Newrest Arlanda. RQ1 examined how current production practices generate waste, while RQ2 explored how these practices can be improved. Each subsection explicitly interprets the findings through either institutional dynamic, lean operational dynamics, or the interaction between the two, as identified in the theoretical framework in Chapter 3 and operationalised in Chapter 5.

6.1 RQ1 – How Current Production Practices Contribute to Food Waste

This section critically interprets how Newrest Arlanda's production system generates food waste, situating the findings within academic debates on food-service waste, institutional constraints, and lean-operations theory. The analysis mirrors the structure of Chapter 5 by examining five drivers: structural overproduction, portioning standards, workflow fragmentation, regulatory lock-ins, and measurement gaps. Together, these themes demonstrate that waste arises not from isolated mistakes but from deeply embedded institutional, operational, and behavioural logics that shape decision-making throughout the aviation catering chain.

6.1.1 Structural Overproduction and Safety Buffers

This theme illustrates *institutional dynamics* identified in Chapter 3, where coercive regulations, airline service expectations, and contractual norms embed overproduction into planning decisions. Participants responsible for planning (A, C, G) consistently described "mandatory buffers", extra trays, spare meal components, contingency batches, that are produced regardless of expected passenger loads. This aligns with global food-service research showing that uncertainty and risk management are major contributors to overproduction waste (Parfitt et al., 2010; Heikkilä et al., 2016; Dhir et al., 2020). The aviation context amplifies these dynamics because of high passenger variability, last-minute booking changes, and stringent service standards.

Several airline catering studies similarly identify structural overproduction as an inherent feature of aviation meal provision. Chen and Hidalgo (2021) find that airline caterers universally incorporate "safety cushions" to avoid reputational and contractual penalties. Thamagasorn and Pharino (2019) show that halal aviation kitchens consistently overproduce due to uncertainties in exact passenger counts and strict separation rules. Likewise, Ross (2014) and Mirosa et al. (2023)

demonstrate that variations in passenger demand and frequent last-minute airline adjustments force caterers to maintain large production margins. Aghazadeh's (2025) machine-learning work further confirms that even advanced forecasting cannot eliminate the operational need for built-in buffers, because airlines prioritise passenger satisfaction over food-waste reduction.

Institutional theory helps explain why buffers at Newrest Arlanda persist even when staff recognise them as wasteful. According to participants, safety margins are treated as "non-negotiable rules," embedded in airline service expectations, quality audits, and contractual obligations. These buffers are not discretionary decisions made by individual planners; they represent coercive institutionalised safety practices, structures that constrain organisational action regardless of local efficiency concerns. This is consistent with the idea that institutional logics can override operational optimisation (Carroll, 1999; Lo et al., 2012).

However, a contrasting body of research in operations and lean production challenges this inevitability. Lean operations emphasise tight coupling between production and demand, calling for eliminating overproduction, the "worst form of waste" (Womack & Jones, 1996, 2003). Studies on food supply chains show that integrating real-time information flows can reduce the need for safety buffers (Akkerman et al., 2010; Grunow & Gobbi, 2009). Dora et al. (2016) argue that food-service operations can minimise buffers by applying lean forecasting, batch reduction, and flexible cooking strategies.

The findings from Newrest Arlanda demonstrate the tension between these two paradigms. While lean theory promotes buffer elimination, aviation catering operates under a coercive institutional regime that incentivises overproduction to guarantee service continuity. This positions structural overproduction not as an operational flaw but as a risk-averse institutional logic: the organisational safety net that ensures compliance and protects against service failures. In this sense, structural overproduction is an "institutionalised waste," recognised by staff yet maintained because the alternative, meal shortages, is perceived as unacceptable by regulators and airline clients.

6.1.2 Portioning, Tray Standards and "Comfort Waste"

This theme illustrates *hybrid institutional–lean dynamics* identified in Chapter 3, where institutional accountability pressures interact with lean inefficiencies to produce routine overproduction at component level. Alongside structural buffers, the study reveals how fixed

portioning standards and tray-assembly requirements generate what staff described as “comfort waste.” Tray layout rules dictate exact quantities and precise aesthetic presentation, resulting in excess production of each component to ensure uniformity. Participants in production and cold kitchen roles (D, E) emphasised the need for trays to “look identical,” which mirrors findings in the food-service sector where standardisation and visual expectations drive component-level waste (Betz et al., 2015; Filimonau & De Coteau, 2019; Zhang et al., 2020).

The behaviour of producing extra trays, overfilling containers, or creating surplus components can be interpreted through behavioural and psychological frameworks. Lo et al. (2012) describe how employees engage in protective behaviours to avoid blame, criticism, or service failure. Similarly, Reynolds et al. (2019) show that staff across food sectors overproduce as a form of risk mitigation, especially in settings where customer dissatisfaction carries high repercussions. These insights closely align with the emotions expressed by frontline staff at Newrest Arlanda, who emphasised that “it is better to have extra than to run out,” revealing a behavioural safety mechanism rather than poor operational discipline.

The concept of “comfort waste” at Newrest Arlanda therefore reflects defensive operational behaviour, employees overproduce or overfill to avoid conflict with supervisors, chefs, or airline auditors. This resonates with practice-theory approaches that highlight how waste is shaped by social norms and workplace expectations rather than pure technical inefficiencies (Evans, 2012; Hebrok & Boks, 2017). Lean theorists, however, critique such behaviours as violations of standard work and root-cause discipline. Liker (2004) and Imai (1986) argue that over-portioning and excess preparation constitute avoidable waste resulting from unclear instructions, poor feedback loops, and lack of empowerment. Studies applying lean to food operations show that eliminating “just-in-case” behaviours requires strong training and visual controls (Vlachos, 2015; Gładysz et al., 2020).

This contrast highlights the dual nature of portioning waste at Newrest Arlanda. From a lean perspective, such overproduction reflects inefficient routines; from an institutional-behavioural perspective, it represents an adaptive response to accountability pressures and aesthetic standards. The aviation catering context, with its high scrutiny and strict uniformity requirements, encourages comfort waste, suggesting that behavioural drivers may outweigh technical solutions unless institutional expectations shift.

6.1.3 Fragmented Workflows and Handover Losses

This theme illustrates lean-related operational dynamics identified in Chapter 3, where breakdowns in flow, coordination, and information transfer generate avoidable waste across production stages. Participants across all levels (A, C, D, E, H) described situations where misaligned counts, timing mismatches, or incomplete information led to reprocessing, extra batches, or discarding of products that could not be reintegrated into the flow.

This finding aligns with research showing that multi-stage institutional food systems, such as hospitals, schools, and large catering facilities, exhibit higher waste due to coordination failures (Engström et al., 2022; Eriksson et al., 2020). Goonan et al. (2014) similarly observe that each handover in healthcare food service introduces uncertainty, leading to mismatched supply and demand at the point of service. From an operations management perspective, Grunow and Gobbi (2009) note that cold-chain food systems are particularly vulnerable to losses because delays or miscommunication can compromise temperature integrity, forcing disposal under safety rules. Akkerman et al. (2010) further argue that fragmented information flows impede the optimisation of food distribution, leading to inefficiencies that accumulate across stages.

Lean theory conceptualises these problems as "flow discontinuities": interruptions in the value stream that create motion waste, waiting waste, inventory waste, and rework (Womack & Jones, 1996; Dora et al., 2016). Participants' descriptions of "batches arriving earlier or later than they should," "missing components being discovered too late," or "trolleys not matching the production list" clearly illustrate dysfunctional flows. Thus, workflow fragmentation at Newrest Arlanda is not a collection of isolated mistakes but a structural feature of a highly segmented production system. The complexity of aviation catering amplifies the risk of handover failures, while the coercive constraints of timing, temperature, and airline specifications limit the ability to correct errors later in the chain. As a result, waste accumulates not because staff fail but because the system's architecture inherently multiplies small discrepancies.

6.1.4 Regulatory Lock-Ins and the Category 1 Problem

This theme illustrates coercive institutional dynamics identified in Chapter 3, where regulatory lock-ins define non-negotiable boundaries for waste prevention and recovery. Participants described discarding food that was still edible simply because it breached documentation

requirements or was returned on sealed trolleys, an experience strongly consistent with industry reports (Food Control Consultants, 2024; IATA, 2022, 2023). These findings reflect the coercive power of Regulation EC 1069/2009, which classifies international catering waste as Category 1, requiring incineration or deep landfill, with no reuse, redistribution, or donation allowed (European Commission, 2009). The regulation was originally designed for biosecurity, but as several scholars argue, its rigidity blocks higher tiers of the food-waste hierarchy such as prevention, reuse, redistribution, and recycling (Papargyropoulou et al., 2014; Teigiserova et al., 2020).

Similar tensions between safety regulations and waste minimisation appear in hospital food-service systems, where strict time–temperature rules lead to large quantities of edible food being discarded (Engström et al., 2022). Thamagasorn and Pharino (2019) also report that aviation kitchens in Thailand face unavoidable waste due to safety-driven discard policies. Circular-economy research critiques such regulatory lock-ins as systemic barriers that entrench linear consumption and disposal patterns (Ellen MacArthur Foundation, 2019; Jurgilevich et al., 2016; Geissdoerfer et al., 2017). The findings from Newrest Arlanda reflect this critique: even when operational improvements reduce waste upstream, regulatory frameworks enforce absolute disposal downstream, eroding the potential impact of responsible production efforts.

Thus, regulatory lock-ins at Newrest Arlanda represent not simply compliance requirements but institutional constraints that fundamentally shape the waste landscape. They demonstrate how aviation catering operates within a tightly bounded regulatory regime where safety rationales override circular-economy aspirations.

6.1.5 Invisible Waste and Measurement Gaps

This theme illustrates institutional mechanisms of invisibility identified in Chapter 3, where compliance-oriented measurement systems obscure the causes of waste and limit organisational learning. Moreover, data rarely loop back to planning or forecasting teams, limiting their potential to inform improvements. This finding echoes global concerns about missing or low-resolution food-waste data. Xue et al. (2017) argue that the absence of detailed and reliable waste metrics hampers accurate understanding of waste drivers. UNEP & FAO (2019) similarly note that many food-service organisations collect data only for compliance or reporting, not for operational learning.

In contrast, studies show that detailed measurement can produce significant reductions. For example, Hanson and Mitchell (2017) highlight that organisations which track waste by type, cause, and production stage can reduce waste by up to 50%. Reynolds et al. (2019) and Eriksson et al. (2020) report that detailed measurement and transparent reporting are key enablers of effective interventions. At Newrest Arlanda, current waste data function primarily as compliance artefacts, not diagnostic tools. This undermines lean-style continuous improvement, which requires real-time visibility of waste flows (Liker, 2004). It also hampers triple-bottom-line (TBL) and circular-economy ambitions, which depend on feedback mechanisms to reduce environmental impacts (Elkington, 1998; Jurgilevich et al., 2016; Geissdoerfer et al., 2017).

The result is a paradox: despite extensive operational data, the system lacks the actionable intelligence needed to address root causes. Waste becomes visible only at the end of the process, when it is too late to intervene, reflecting a system designed more for regulatory assurance than for learning.

6.2 RQ2 – How Responsible Production Practices Can Be Improved

This section interprets the improvement opportunities identified by staff at Newrest Arlanda in relation to international research on food-service waste, circular-economy principles, and lean production. Whereas Section 6.2 ("Sensing") explained how systemic, institutional and behavioural factors drive waste, this section ("Seizing") evaluates how responsible production could be advanced within and against the constraints of aviation catering. The analysis is structured around five domains: strengthening existing practices, redesigning planning processes, improving operational flows, engaging employees, and addressing structural and institutional levers. The themes discussed below reflect attempts to strengthen responsible production through lean-oriented improvements, while simultaneously revealing the institutional constraints that limit their scope.

6.2.1 Strengths and Limits of Existing Waste-Reduction Practices

This theme illustrates lean-oriented improvement efforts operating within institutional constraints, where local efficiency gains are possible but structurally limited. Staff described a range of existing efforts to reduce waste, batch cooking, just-in-time finishing of hot components, reuse of surplus food in staff meals (where legally permitted), recipe optimisation, and adherence to Standard

Operating Procedures (SOPs) designed to minimise mismatches. These practices overlap with documented strategies in the food-service literature that reduce waste at the production stage. For instance, Heikkilä et al. (2016) note that batch size optimisation and flexible preparation routines can prevent both overproduction and quality losses, while Marthinsen et al. (2012) show that improved portion control and on-the-spot adjustments are effective in large canteen settings. Betz et al. (2015) similarly demonstrate that recipe redesign and standardisation can yield measurable reductions in waste volumes across kitchens of varying sizes. Reynolds et al. (2019) highlight that operational tweaks, such as clearer SOPs, improved on-floor communication, and visual controls, are among the most successful micro-level interventions.

The findings from Newrest Arlanda confirm these global observations: tactical adjustments in recipes, trays, and cooking sequences do help reduce waste in specific subprocesses. For example, staff described how reverting a garnish or adjusting the cold-meal components prevented unnecessary overproduction. These examples echo Reynolds et al.'s (2019) argument that targeted process improvements can achieve short-term reductions even without structural redesign.

However, the aviation context introduces unique constraints that limit the scale of impact achievable through such downstream interventions. The existing practices occur after key waste determinants, menu complexity, mandatory safety buffers, tray-layout rules, have already been set. This aligns with findings from airline and aviation food-waste studies. Thamagasorn and Pharino (2019) showed that downstream kitchen efficiency in-flight catering has limited influence compared to upstream structural decisions. Chen and Hidalgo (2021) argue that because airlines dictate menus, portion sizes, service concepts and class differentiation, caterers have little flexibility to adjust production volumes once specifications are locked. Mirosa et al. (2023) likewise observed that most waste-reduction initiatives implemented by New Zealand airline caterers were operational and tactical, with limited strategic reach. This mirrors the case at Newrest Arlanda: staff are actively mitigating waste in small ways, but these interventions remain constrained by menu rigidity, regulatory demands, and airline-imposed standards.

These constraints reinforce that existing efforts, while valuable, are downstream and tactical rather than strategic. They operate within the current system rather than altering the system itself. In academic terms, they fit Marthinsen et al.'s (2012) classification of "first-order" interventions, incremental efficiency improvements, as opposed to "second-order" structural changes that

reshape planning logics, service specifications, or institutional rules. As such, the findings highlight a key challenge: aviation caterers operate in an ecosystem where major determinants of waste lie outside the kitchen, meaning that responsible production requires earlier intervention in the planning process, contractual arrangements, and regulatory framework.

6.2.2 Planning-Stage Interventions

This theme illustrates institutional leverage points identified in Chapter 3, where upstream planning decisions exert the greatest influence on waste generation. A strong message across interviews was that responsible production must begin "before cooking starts", at the planning stage. Staff suggested simplifying menus, designing modular components, shortening menu cycles, improving forecast accuracy, and creating more flexible equivalence rules with airlines. These ideas are well aligned with research in operations management emphasising that upstream design decisions heavily shape downstream waste.

Akkerman et al. (2010) and Grunow and Gobbi (2009) argue that in perishable supply chains, complexity in product design and uncertainty in demand are primary waste drivers, and that major reductions are only possible through menu simplification and modularisation. Modularisation, using interchangeable components, allows kitchens to adjust quantities in real time without compromising menu fidelity. Staff suggestions in this study directly echo these models, indicating that workplace knowledge is consistent with theoretical optimisation approaches.

Forecasting also emerged as a major opportunity area. Staff argued that current passenger information is too imprecise and released too late. Aghazadeh (2025) confirms that machine-learning forecasting models can significantly reduce overproduction by tightening predicted passenger counts and connecting production logic with booking patterns. Yet forecasting improvements alone cannot eliminate structural buffers, because aviation's service-reliability expectations impose conservative safety margins. Still, more accurate data could allow caterers to reduce buffer size without compromising reliability.

Circular-economy-oriented aviation catering research similarly emphasises early-stage redesign. Garcia and Patel (2020) propose that circular strategies, such as reconfigurable meal concepts, re-usable components and adaptive catering, must be embedded into menu architecture rather than applied after production. Van der Tuin-Rademaker et al. (2024) demonstrate how a Dutch airport

achieved major waste and emission reductions by redesigning upstream catering and waste-handling structures, rather than by focusing only on kitchen behaviours.

The interviews confirm the logic of Papargyropoulou et al.'s (2014) food-waste hierarchy, which emphasises that waste prevention through strategic design outperforms downstream redistribution or recycling. Similarly, circular-economy principles emphasise slowing, narrowing and closing resource loops through design-led interventions (Geissdoerfer et al., 2017). Staff insights therefore align with the view that responsible production is not only an operational matter but a structural one: aviation catering must incorporate modular menus, adaptable specifications, and improved forecasting as core design features.

Thus, planning-stage interventions represent the most powerful but also the most complex route to responsible production. Their effectiveness depends on collaboration between caterer and airline, willingness to challenge long-established menu standards, and investment in predictive technologies and modular design principles.

6.2.3 Leaner Flows and Cross-Department Coordination

This theme illustrates *lean operational dynamics* focused on improving flow, coordination, and feedback within the constraints of aviation catering. Staff across departments expressed a desire for improved communication, clearer short feedback loops, real-time visibility of over/under-production, and better alignment between kitchen output and trolley-loading requirements. These suggestions are strongly aligned with lean-management principles. Dora et al. (2016) demonstrate that in food-service environments, lean techniques such as standardised information flows, visual controls, and synchronised handovers can significantly reduce waste caused by mismatch and delays. Gładysz et al. (2020) and Vlachos (2015) likewise show that introducing lean tools, kanbans, line balancing, 5S, reduces overproduction and improves flow stability.

The staff proposals match these principles: visual waste dashboards, clearer cross-department communication, and structured handovers directly correspond to Liker's (2004) emphasis on standardised work and Womack & Jones' (1996) focus on continuous flow. If implemented, such measures could reduce the "handover waste".

However, lean management also introduces tensions in the context of aviation catering. Lean promotes just-in-time (JIT) production, minimal inventories, and extremely tight coupling of

processes. In contrast, aviation requires redundancy, buffers, time margins, and strict sequencing to comply with safety and security standards. As King and Lenox (2001) and Dora et al. (2016) note, lean systems in highly regulated environments must be adapted to avoid compromising safety or reliability. The aviation sector's inherent variability, late bookings, last-minute class upgrades, operational disruptions, makes pure JIT impractical.

Therefore, a fully lean system is neither feasible nor desirable. Instead, the findings suggest that Newrest Arlanda functions as a hybrid model: partially lean in its aspiration to reduce inefficiencies and improve flow, yet necessarily non-lean due to aviation's coercive requirements for safety margins. This hybrid positioning aligns with Vlachos (2015), who argues that food supply chains in regulated settings must selectively adopt lean principles that improve stability without removing essential buffers.

Thus, the staff suggestions should be viewed as attempts to create "leaner" rather than "lean" flows: reducing coordination waste while preserving safety redundancies. This balanced approach reflects an adaptive interpretation of lean thinking suitable for aviation catering.

6.2.4 Staff Engagement, Behaviour and Organisational Culture

This theme illustrates hybrid behavioural–institutional dynamics, where individual motivation interacts with organisational norms and accountability structures. Interviews revealed strong emotional and ethical reactions to waste: staff expressed that "it hurts to throw food" and frustration that they are blamed if production falls short. These sentiments resonate with behavioural research on pro-environmental behaviour in organisations. Lo et al. (2012) emphasise that employees' environmental actions depend on perceived responsibility, fear of punishment, and the presence of supportive structures. The emotional discomfort expressed by staff reflects the psychological tension between operational rules and personal values.

Employee green behaviour also depends on organisational context. Vizzoto et al. (2020) show that recognition, meaningful involvement, and transparent feedback significantly strengthen pro-environmental actions. Currently, training at Newrest Arlanda focuses largely on hygiene and compliance, with little emphasis on the purpose or impact of waste reduction. This contrasts with research recommending that sustainability training include context, meaning, and empowerment (Dhir et al., 2020).

Behavioural insights emphasise that technical solutions alone cannot succeed without cultural alignment. Evans (2012) demonstrates that food waste is deeply embedded in social practices, meaning that changing routines requires shifts in norms and shared understanding. The findings suggest that strengthening organisational culture—through waste dashboards, cross-team briefings, recognition schemes, and transparent communication—would foster staff ownership. Such measures also align with the lean concept of "respect for people" (Liker, 2004), which emphasises empowerment and shared problem-solving.

Overall, staff engagement emerges as a critical lever that connects technical interventions with daily decision-making. Without an enabling culture, even well-designed processes may underperform because behavioural drivers of "comfort waste," blame avoidance, and risk aversion remain unaddressed.

6.2.5 Structural and Institutional Levers Beyond the Kitchen

This theme illustrates system-level institutional dynamics, where responsibility for waste reduction extends beyond the kitchen to contracts, regulation, and governance structures. Finally, participants highlighted opportunities that exceed the scope of kitchen operations: revisiting rigid airline specifications, exploring regulatory flexibility around Category 1 waste, and redefining internal Key Performance Indicators (KPIs) to prioritise waste prevention. These suggestions align with global policy agendas advocating for systemic change in food systems.

The United Nations (1992) and UN DESA (2021) emphasise that sustainable consumption and production (SDG 12) require institutions to reconfigure rules, incentives and governance systems. In aviation, the European Commission's (2020) circular-economy action plan calls for transforming waste-intensive sectors by redesigning supply chains and regulatory frameworks. FAO (2022) and UNEP (2021) similarly argue that food systems transformation requires multi-actor cooperation, not isolated operational fixes.

Aviation-specific literature reinforces this perspective. IATA (2023) highlights that reducing in-flight waste demands coordination among airlines, caterers, airports and regulators. Garcia and Patel (2020) argue that true circularity in airline catering requires redesigning service concepts, not merely altering kitchen routines, to enable reuse, recycling, and minimisation. Van der Tuin-

Rademaker et al. (2024) demonstrate that circular airport systems emerge only when waste-handling contractors, caterers and regulatory bodies collaborate to create integrated solutions.

Participants' suggestions to renegotiate airline menu specifications, explore alternatives to Category 1 disposal, and shift KPIs from punctuality to responsible production reflect this systemic perspective. They recognise that meaningful change requires alignment between caterer, airline, regulator, and waste-management actors. This multi-actor framing echoes Papargyropoulou et al.'s (2014) hierarchy, which positions prevention and reuse at the top, requiring upstream redesign rather than downstream disposal.

Thus, RQ2 reveals that responsible production cannot be achieved solely through kitchen improvements. It demands structural shifts in contracts, regulatory interpretations, and collaborative governance. The kitchen is part of the system, but not the system itself.

6.3 Concluding Synthesis of Discussion

Overall, the discussion shows that food waste in aviation catering is structurally generated, not simply the consequence of poor practices or individual decisions. In relation to RQ1, the findings demonstrate that waste emerges through forecasting buffers, rigid tray and portion standards, fragmented multi-stage workflows and the powerful regulatory lock-ins imposed by Category 1 rules and airline specifications. These drivers align with wider food-service evidence but are intensified by aviation's uniquely coercive institutional environment. In relation to RQ2, staff at all levels identified feasible opportunities for more responsible production, simplified menus, improved planning logic, tighter cross-department communication and stronger engagement, but emphasised that such improvements require both institutional change (contracts, regulations, KPIs) and lean-oriented operational refinement, rather than isolated local fixes. Across all themes, the discussion demonstrates clear correspondence between the institutional and lean analytical lenses introduced in Chapter 3, the abductive analysis described in Chapter 4, and the empirically grounded themes presented in Chapter 5.

While many of the findings in this study align with prior research on food waste in aviation catering and institutional food service, the contribution of this case lies in explaining *why* these waste drivers persist despite awareness and existing mitigation efforts. Rather than merely confirming that forecasting buffers, rigid standards, and regulatory constraints generate waste, this study

shows how such practices are normalised through institutional rules, service expectations, and accountability structures. The findings demonstrate how staff rationalise waste as a necessary outcome of compliance and risk avoidance, and how responsibility for waste reduction becomes fragmented and constrained within the organisational system. In doing so, the study moves beyond identifying waste drivers to explaining their persistence in practice.

7. Conclusion

This study set out to examine how responsible production practices could minimise food waste in aviation catering, with specific attention to Newrest Arlanda as a single-case context. Guided by two research questions, first, how current production practices contribute to food waste, and second, how these practices can be improved, the study adopted a qualitative case-study design to capture the complexity, interdependencies and institutional constraints that shape food-production decisions in this highly regulated environment. Aviation catering offers a particularly revealing context because production is tightly coupled with strict safety rules, time-bound workflows, and airline specifications, all of which fundamentally shape waste outcomes. The use of semi-structured interviews and written responses enabled access to multiple hierarchical perspectives, generating a rich empirical basis for understanding both the structural and behavioural mechanisms underlying food waste.

The findings for RQ1 reveal that food waste in aviation catering is best understood as structurally generated rather than the result of individual negligence or isolated operational failures. The first major contributor is structural overproduction, driven by forecasting buffers, safety margins, no-show allowances and rigid airline service policies. These buffers have become institutionalised routines rather than evidence-based adjustments, reflecting risk aversion and the high penalties associated with shortages. Similarly, portioning rules and tray-presentation standards normalise what staff described as “comfort waste,” produced as a form of self-protection against customer complaints or managerial blame. A third driver lies in fragmented workflows and handover losses across hot kitchen, cold kitchen, tray assembly and dispatch. Each handover introduces opportunities for mismatches in counts, time breaches and communication breakdowns, which in turn create waste that no single department can fully prevent. The fourth element relates to regulatory lock-ins, where Category 1 waste rules and aviation-hygiene requirements mean that even visually acceptable food must be discarded if documentation, temperature thresholds or seal integrity are compromised. Finally, data gaps and limited granularity prevent the organisation from learning from its waste patterns. While waste is logged, it is rarely analysed in relation to planning assumptions, undermining opportunities for systemic improvement. Together, these findings demonstrate that food waste is embedded in the operational architecture and institutional environment of aviation catering.

For RQ2, the study identifies several realistic entry points for improving responsible production practices, based on participant insights. At the planning stage, staff emphasised the potential of simpler menus, modular components and more flexible equivalence policies to reduce overproduction and allow better alignment between demand and supply. Improved forecasting methods and shorter planning cycles were also seen as necessary structural reforms. At the operational level, participants proposed leaner flows, clearer handover communication, real-time feedback loops and more accurate trolley-count alignment, signalling interest in small but meaningful process refinements. The findings also highlight the importance of staff engagement and training, with employees expressing a desire for clearer guidance, visual waste feedback, and recognition for waste-reduction efforts, elements that could strengthen ownership and agency. Finally, participants pointed to structural and institutional levers, including revisiting airline portion specifications, reinterpreting regulatory provisions where safe and permissible, and redefining internal KPIs to prioritise waste reduction. Across these opportunities, a unifying insight emerges: staff believe that responsible production must be designed earlier in the process and supported by organisational and institutional alignment rather than relying on downstream fixes.

7.1 Theoretical Contribution: Integrating Institutional Theory and Lean Thinking

This study contributes theoretically by demonstrating that aviation catering operates within a uniquely coercively constrained production system, where institutional pressures—rooted in food-safety regulation (EC 1069/2009), airline specifications, audit requirements, and security protocols—set strict boundaries on what constitutes permissible production behaviour. While lean thinking traditionally emphasises flow, waste elimination and just-in-time responsiveness (Womack & Jones, 1996; Liker, 2004), this case shows that lean principles can only function in selectively permitted pockets. Staff propose kaizen-style improvements, real-time feedback loops, clearer handover routines and better cross-department coordination, yet these lean behaviours remain subordinate to non-negotiable institutional rules such as Category 1 disposal mandates (European Commission, 2009; IATA, 2022; Food Control Consultants, 2024).

Based on these findings, the study advances the conceptual idea of “Institutionally Bounded Lean”, or “Constrained Responsible Production,” to describe production systems where safety, compliance and contractual requirements dominate decision-making, shaping both overproduction

and limited flexibility. This refines existing theorisation by showing that lean logics and institutional logics do not compete but coexist in a hierarchy of priorities, with institutional obligations always superseding operational efficiency.

The study makes a theoretical contribution by demonstrating how lean production principles are institutionally bounded within aviation catering. While lean theory emphasises waste elimination, flow optimization, and continuous improvement, this case shows how institutional pressures—such as regulatory compliance, airline contracts, and safety norms—limit the applicability of lean solutions. The concept of *institutionally bounded lean* helps explain why waste persists even in organisations committed to efficiency and sustainability, extending existing institutional theory by illustrating how operational logics are constrained rather than freely optimised.

Within the limited academic literature on airline catering (Ross, 2014; Mirosa et al., 2023; You, 2022; You et al., 2020), this study extends current understanding by theorising aviation catering not merely as a high-waste environment but as a hybrid system whose improvement potential is structurally bounded yet still capable of targeted lean refinement.

7.2 Practical Implications for Aviation Catering

The findings highlight several practical implications for Newrest Arlanda and the wider aviation-catering sector. First, tactical operational improvements are immediately feasible without requiring regulatory change. These include refining portioning practices to avoid defensive overfilling, enhancing communication during handovers, implementing clearer visual controls, and improving routine waste monitoring so staff receive meaningful feedback. These small adjustments can strengthen flow reliability and reduce mismatch-related waste.

Practically, the study contributes by identifying where waste reduction efforts are realistically possible and where they are structurally blocked. The findings offer actionable insights for catering managers, airlines, and policymakers by distinguishing between operational improvements that can be implemented internally and institutional changes that require collaboration across actors. This clarity helps practitioners avoid misplaced responsibility on frontline staff and instead focus on planning-stage redesign, contractual flexibility, and regulatory dialogue as key levers for meaningful waste reduction.

Second, strategic improvements relate to planning and menu logic. Simpler menus, modular components, tighter alignment between forecasts and historical data, and negotiated flexibility in equivalent-item substitutions can meaningfully reduce systematic overproduction. Updating internal KPIs to balance “no shortages” with “waste minimisation” would signal organisational commitment and reshape frontline behaviour.

Third, the findings reveal institutional-level opportunities that require collaboration across caterers, airlines and regulators. These include revisiting service specifications that drive unnecessary redundancy, co-developing risk-based safety margins rather than fixed buffers, and engaging regulators in dialogue about safe but more circular interpretations of Category 1 waste constraints. Industry alliances and multi-actor forums, already emerging in the sector, offer practical channels for developing shared standards and trialling innovations.

7.3 Suggestions for Future Research

This study highlights aviation catering as a highly regulated, operationally fragmented and behaviourally complex environment, revealing several directions for future research that can build on its findings. One important avenue concerns the regulatory architecture surrounding international catering waste, particularly Category 1 rules and EC 1069/2009, which strongly limit possibilities for reuse, redistribution and other circular-economy innovations. Further empirical work should examine how these regulations are interpreted across different airports and jurisdictions, and whether risk-based or context-sensitive approaches might maintain food-safety integrity while opening space for more sustainable practices. Comparative studies between countries or regulatory regimes would help clarify whether some systems unintentionally foster more circular solutions than others, thereby illustrating the institutional variability that remains largely undocumented.

A second direction involves expanding the analytical lens beyond a single caterer. Aviation catering is inherently interdependent, involving airlines, caterers, airport authorities and waste contractors, yet existing research tends to examine one actor at a time. Multi-site and multi-actor studies would allow researchers to trace how responsibilities, constraints and incentives interact across organisational boundaries. Such work could reveal where systemic bottlenecks occur, how decisions at one point in the chain constrain or enable others, and what forms of collaborative governance or joint contracting might meaningfully reduce food waste at scale.

Another key opportunity lies in studies that integrate quantitative waste measurement with qualitative process analysis. This study found that waste data often lacks granularity and is rarely used for organisational learning. Mixed-methods research could document waste flows in detail while also exploring the meanings, routines and decision logics behind them. Such an approach would provide a stronger empirical basis for targeted interventions, especially within complex multi-step production systems.

Longitudinal research also offers substantial promise. As caterers increasingly adopt digital tools, refine menu cycles, renegotiate airline specifications or introduce lean-inspired communication routines, it will be valuable to track changes over time. Following organisations through these transitions would reveal which improvements become embedded, which fade under operational pressure, and how structural constraints evolve as industry priorities shift.

Finally, future research should examine the behavioural and cultural dimensions of food waste more closely. This study showed how blame avoidance, emotional discomfort and limited psychological safety influence production and portioning decisions. Understanding these dynamics could help design interventions that complement technical and regulatory changes. Parallel to this, emerging technologies, such as machine-learning–based forecasting highlighted by Aghazadeh (2025), warrant further investigation to assess their feasibility, accuracy and adoption within aviation catering.

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Appendix I: Interview Guide

Appendix A – Semi-structured interview questions for roles in management.

The semi-structured interviews with management-level staff at the case company were conducted using the guide outlined below. The questions were intended to gain deeper insights into operational practices, waste reduction strategies, and alignment with responsible production principles. Although the same basic concerns were administered to each participant, the follow-up evaluations were developed according to the responses provided.
The final thesis will not disclose any identifying information, and all responses are confidential.

Interview Questions

1. Can you walk me through your typical day and your role in food production or waste management?

2. How are portion sizes and meal quantities determined daily, and what happens if there are consistent overproduction or leftovers?

3. What are the most common sources of food waste in your operations, and how do you address them?

4. How do industry regulations and food safety requirements influence your ability to reduce food waste?

5. What systems or technologies are in place to track and monitor waste, and how accurate/useful are they?

6. Can you describe any specific waste reduction strategies or programs that have been implemented and their effectiveness?

7. Are there initiatives based on circular economy or lean production principles, and how are they applied here?

8. What happens to surplus food that cannot be served? Are there any repurposing, redistribution, or donation partnerships?

9. What challenges make it hardest to match production with actual demand?

10. How are employees trained or informed about waste reduction, and how is their participation encouraged?

11. Have you received any training on sustainable practices or waste minimization? How often?

12. What are the primary barriers—operational, cultural, or regulatory—to further reducing waste?

13. If you had the power to change one thing to make food production here more sustainable, what would it be?

14. How do you see waste management and responsible production evolving in the next five years?