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**Executive Summary:**

This report investigates how IGA supermarkets can adopt circular economy strategies, reduce, reuse, and recycle to minimize food waste, aligning with Australia’s national goal to halve food waste by 2030. Using real-time sales data from IGA Valley over one month (06/05/2025 to 06/06/2025), we analyzed variables such as sales volume, profit margins, discounting behavior, and product categories most at risk of contributing to waste.

To deepen our insights, we projected annual trends based on the observed monthly data, exploring patterns in profitability, gross margins, and the contribution of perishable vs non-perishable items to food waste. These findings were then extrapolated across IGA’s broader network of 1301 stores to estimate national-level implications and assess alignment with circular economy practices.

The research follows a mixed-methods approach, combining quantitative data analysis (including descriptive statistics, T-tests comparing gross profit margins by category, and correlation matrices) with qualitative analysis of sustainability reports from IGA, Woolworths, and Coles. This integration provides both data-driven insights and a contextual understanding of each supermarket’s performance.

We also benchmarked IGA’s efforts against centralized competitors like Woolworths and Coles, comparing key sustainability metrics such as waste diversion rates, emissions reductions, and meal donation programs. While Woolworths and Coles report diversion rates of 80% and 82.5% respectively, IGA Valley trails behind at 65.9%, indicating significant room for improvement.

This comprehensive analysis highlights the need for IGA to implement standardized, data-informed circular economy strategies across all stores to effectively reduce food waste and improve its environmental performance.

**Introduction:**

Food wastage has become one of the burning issues in the Australian retail sector, where supermarkets play a significant role in generating and mitigating waste. Retailers in Australia are expected to implement circular economy (CE) strategies to support the Australian Government’s National Food Waste Strategy, which aims to reduce food waste by half by 2030 (Somlai, 2023). Currently, in Australia, the retail sector contributes significantly to the growing problem of food waste, with over 527 kilotons of food waste generated every year. Approximately 70% of this is still edible when discarded (Devin & Richards, 2018). The environmental and economic consequences of this food waste are significant, costing the Australian economy billions of dollars every year. In this report, the food wastage mitigation strategies of IGA, one of the prominent decentralized supermarket chains, have been discussed through the implementation of circular economy strategies.

Some supermarket giants, like Coles and Woolworths, which are the main competitors of IGA, operate under a centralized structure and have a unique approach to handling food wastage. IGA stores are independently owned and operated. A centralized model can allow for streamlined control and cost efficiencies of operating from one locality. In contrast, a decentralized model diffuses control and resources across several locations. This model has the potential for a quicker on-site delivery network that may create better local customer satisfaction (Granot & Sošić, 2003). Each store manages its inventory, markdown, and waste reduction efforts independently which leads to inconsistencies in mitigation measures across the networks. This research focuses on one IGA store and uses one month of detailed sales data to recognize patterns, inefficiencies, and potential interventions aligned with CE principles.

The main motive behind this study is generated from both environmental and economic concerns. Circular Economy (CE) principles in food retail focus on reducing waste; responsibly utilizing resources; and reducing environmental impact throughout the entire food supply chain (Kusumowardani et al., 2022). Environmental concerns like greenhouse gas emissions are caused by increased food waste while businesses lose their revenue and experience inefficiencies in daily operations. This report suggests different actionable strategies for IGA to reduce its food waste through data analysis, benchmarking against industry leaders, and evaluating sustainability reports.

This report focuses on exploring the differences between the implementation of circular economy (CE) in both centralized and decentralized retail models and gaining insights that apply to the entire IGA network. The findings of this report should help optimize several areas like inventory management, improving profit margins, increasing waste diversion, and enhancing social responsibility, thus contributing to a more sustainable retail ecosystem in Australia.

**Research question and Objectives:**

**Q1.** How can circular economy strategies be applied to reduce food waste in IGA supermarkets, and how does IGA’s decentralized structure affect its ability to implement sustainable practices compared to centralized competitors like Woolworths and Coles?

**Objectives:**

1. **To identify the key factors at IGA Valley that could contribute most to food waste in relation to sales, profitability, and discounted products.**
2. To evaluate the reuse, redistribution, and recovery strategies in retail supermarkets using circular economy frameworks.
3. To predict the annual food waste contribution based on product behavior and sales trends, and to develop strategies to reduce food waste and prevent reaching the projected levels.
4. Identifying the contribution of a specific store in implementing circular economy strategies to reduce food waste and evaluating how these practices can be scaled across all IGA stores in Australia.
5. Comparing circular economy strategies between decentralized and centralized retail models, identifying gaps and effective techniques, and exploring how these can be implemented to reduce food waste and contribute to the circular economy.

**Literature review:**

**3.1 Circular Economy and Food Waste in Retail**

The circular economy (CE) is a strategic framework that replaces the traditional linear "take-make-dispose" model with systems that reduce waste through reuse, recycling, and value recovery (Ellen MacArthur Foundation, 2022). CE in food retail entails reducing excess inventory, increasing product shelf life, and reintegrating waste back into the supply chain (Papargyropoulou et al., 2014).

Supermarkets in Australia play an important role in reducing food waste by acting as a vital link between producers and consumers. The National Food Waste Strategy aims to reduce food waste by half by 2030, in line with SDG 12.3 (DAWE, 2021). According to the CSIRO (2023), inadequate inventory forecasting and overly stringent cosmetic standards are common causes of food waste in retail.

Centralized retailers, such as Woolworths and Coles, have implemented CE strategies such as food donation, smart ordering, and real-time analytics. However, IGA operates on a decentralized model, with each store independently managing procurement and markdown policies, resulting in inconsistent CE implementation (Metcash, 2024; Anderson et al., 2023).

**3.2 Financial Structures and Food Waste Incentives**

Economic motivations can hinder CE adoption in supermarkets. According to the Australia Institute (Anderson et al., 2023), supermarkets profit an estimated $1.2 billion per year from food waste due to profit margins built into product pricing. This economic structure can act as a disincentive for waste reduction, especially when markdowns are used reactively to shift unsold goods.

Supermarket sections with a lot of discounts usually make less money and produce more food waste. This highlights the need for more effective circular economy strategies, such as better stock planning and the establishment of smart food donation programs (Lebersorger & Schneider, 2014; Eriksson et al., 2012).

**3.3 CE Implementation in Decentralized Supermarkets**

Using circular economy (CE) strategies in decentralized supermarkets like IGA comes with unique challenges. These include things like unclear waste rules, limited funding, and supply chains that aren’t well connected. For CE to work well, it’s important to involve suppliers, local partners, food banks, and composting services. Success also depends on strong leadership and proper staff training at each store. Unlike large chains that follow one system, IGA stores depend on individual managers to take initiative and understand how to reduce waste (Tamasiga et al., 2022; Nguyen & Foster, 2021; Martin & Yates, 2022).

**3.4 Global Benchmark: Tesco**

Tesco, a UK supermarket chain, uses circular economy (CE) strategies to reduce food waste. For example, they sell "imperfect" fruits and vegetables and provide discounts on food that is about to expire. They also use smart technology to forecast customer purchases and keep detailed records on food waste. These efforts have helped Tesco reduce food waste by 45% since 2016 (WRAP, 2023).

IGA can take similar steps by utilizing digital tools to track product expiration dates and automatically apply discounts. Despite the fact that Tesco uses a centralized system, these tools and performance measures can be used effectively in independent stores such as IGA.

**3.5 Transformative Practices and Innovation**

There are three primary ways for supermarkets to implement circular economy (CE) practices: through habits such as rotating stock by expiry date, through planned rules and policies, or by experimenting with new ideas such as converting waste into valuable products. These are known as "transformativity" modes, and they explain how stores interact with CE at various levels. This is important for IGA because each store is unique, so CE strategies must be adaptable and simple to implement at each location (Lehtokunnas, 2023).

**3.6 Food Donation and the Rebound Effect**

Donating extra food is a common circular economy (CE) strategy for reducing waste and assisting people who do not have enough to eat. But there’s a risk: some stores might order too much food on purpose, thinking they can just donate the extra. This can actually make the waste problem worse instead of preventing it in the first place (Sundin et al., 2022).

To address the root cause of waste, food donation should be combined with predictive analytics, waste tracking systems, and employee education at the store level.

**3.7 Systematic Review Insights**

A study in 2023 by Garrone and others looked at 45 research papers on circular economy (CE) in food retail. They found that the best ways to reduce food waste involved improving delivery systems, using technology, and changing staff behavior. The study also noted that while decentralized supermarkets may spend more to get started, they have more freedom to create solutions that fit their local needs (Garrone et al., 2023).

This reinforces IGA's need to invest in low-cost digital tools and local training programs that provide high financial and environmental returns. While most reviewed interventions were designed for centralized retailers, our study tailors these best practices to the distinct structure of IGA's independent stores.

**3.8 Summary and Research Justification**

The literature confirms that circular economy strategies in food retail can reduce waste while increasing profitability. However, there is a significant gap in empirical research on decentralized supermarket models such as IGA, particularly in the Australian context. Most findings are based on centralized chains in Europe or large-scale studies that assume top-down implementation structures.

This research fills the gap by applying real IGA sales data, profitability metrics, and donation benchmarking to build department-specific CE strategies. The goal is to uncover actionable, scalable practices that IGA can roll out store-by-store—balancing autonomy with sustainability performance.

**3.9 What We Learned and Why This Research Was Necessary**

According to the reviewed literature, circular economy (CE) practices in food retail, such as donation programs, inventory optimization, and reuse strategies, have a significant impact on reducing food waste, improving operational efficiency, and addressing environmental and ethical concerns. Some studies highlight that supermarkets should use different types of circular economy (CE) practices regular routines, planned strategies, and new ideas based on how their business is set up. This mix helps make CE more effective in different store settings (Sundin et al., 2022; Lehtokunnas, 2023).

Most successful circular economy (CE) examples, like Tesco, are seen in supermarkets that use a centralized system. But IGA is different — each store runs on its own, so things like ordering, discounts, and donations are handled differently at each location. This makes it harder to apply the same CE strategies across all stores (WRAP, 2023). Literature from Tamasiga et al. (2022) and Nguyen & Foster (2021) further highlights that store-level autonomy can create systemic gaps in applying circular strategies.

This disparity compelled us to investigate how a decentralized supermarket like IGA can implement effective CE strategies in a way that is both scalable and sensitive to local store contexts. Our review showed that while IGA has the potential and infrastructure to contribute meaningfully to waste reduction goals, the absence of data standardization, inconsistent donation protocols, and uneven staff preparedness limit sustainable outcomes.

Thus, our research extends the literature by:

* Applying real sales and discounting data to identify department-level inefficiencies.
* Using quantitative tools like t-tests and correlation analysis to validate CE impact.
* Benchmarking IGA’s results against centralized leaders like Coles and Woolworths.
* Offering data-driven, scalable recommendations that account for IGA’s operational reality.

Ultimately, this research bridges the gap between theory and application by showing how CE strategies can be embedded within decentralized retail ecosystems, with IGA as a national case study.

**Research Design:**

Research type: The research adopts a mixed approach in our analysis using descriptive statistics, graphs, and visuals from real-world sales data of IGA Valley, and preparing a model for annual analysis and a qualitative approach, comparing IGA’s annual and sustainability reports with competitors like Woolworths and Coles. The study concludes with a qualitative analysis of food waste data from the Australian Food Waste Sustainability Reports, specifically focusing on the retail sector. This approach aims to understand how IGA is adopting circular economy sustainability practices and to identify areas for improvement in enhancing food diversion rates, in comparison to national retail benchmarks.

Data collection:

The analysis is based on secondary data sourced from the following:

1. IGA Valley Sales Data (06/05/2025 to 06/06/2025): This dataset contains department-level sales information, including columns such as Amount Inc, Amount Ex, Profit, GP%, GST Amount, Profit % Share, Sales % Share, Specials Sales, Specials % Share, and Specials GP%. A detailed table is provided in Appendix 1.
2. IGA Yearly Projection Data: This data is extrapolated from monthly data. A detailed table is provided in Appendix 2.
3. Metcash Sustainability Report (2024), Woolworths sustainability report (2024), Coles sustainability report (2024): Important data were extracted, separating columns like (supermarkets, Category, Amount, Quantity). A detailed table is provided in Appendix 2.

**Data Analysis:**

To conduct an overview of departmental performance, we computed descriptive statistics between the variables of the datasets.

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**Table :1 Descriptive statistics**

Insights:

1. Upon closely analyzing the Amount Inc metric (sales volume), we found a mean of $11,857 with a high standard deviation, indicating significant variation in sales across different departments. Some departments, such as dairy and cigarettes, dominate in sales, while others are marginal. This analysis helps identify the departments that are likely major contributors to high-volume food waste.
2. From the analysis of the 25th and 75th percentiles, we identified high-risk departments with low sales and high discounts, which may lead to increased food waste, as well as departments with high sales but low gross profit percentages, suggesting pricing or margin inefficiencies.

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**Table :2 High risks optimization departments**

Here, we categorized the products into perishable and non-perishable groups and identified fruits and vegetables as a key area for circular economy actions, such as smarter markdowns, donation strategies, and margin improvements.

1. The mean profit was $2,980.32 with high variability (std: $4,177.76). Departments like Phone Cards showed losses (−$383.80), but being non-perishable, they likely don’t contribute much to food waste, highlighting the need to focus on low-margin perishable categories.
2. Mean (18.23) and std (18.60) on Special% share (discounting intensity) suggests inconsistent pricing and inventory strategies, which might be key inputs for circular economy planning.

Correlation analysis:

Descriptive analysis shows individual trends, but to understand how variables like discounts, sales, and profit margins interact, we used correlation analysis. This reveals deeper patterns that help target circular economic actions.

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Table :3 correlation heatmap across different variables.

Here we interpreted the analysis between the following key metrics, which support the use of circular economic strategies.

|  |  |  |
| --- | --- | --- |
| Relationship | Correlation | Interpretation |
| Amount inc vs Profit ex | 0.90 | Strong positive correlation: departments with higher sales tend to earn more profit. |
| Specials % share vs Amount inc | 0.33 | Moderate correlation: heavy discounting occurs more in high-sales departments. This could indicate overstock or poor demand planning. |
| Specials % share vs Profit ex | 0.3 | Mild positive correlation: Some discounted items still yield profit, but it may suggest volume over margin. |
| Specials % share vs GP% | 0.2 | Very weak correlation: frequent discounting does not significantly improve profit margin percentage. |

Here we find that high-sales products are strongly tied to profit. While heavy discounting doesn’t support strong margin efficiency, suggesting departments with high specials%, like confectionery and nut chips, might be risking profitability or increasing waste. So, better forecasting or markdowns alerts, and donation strategies need to be prioritized in high-discount, low GP% departments.

**Perishable vs Non-perishable categories**

Hypothesis Testing: GP% in Perishable vs Non-Perishable Departments

To assess whether gross profit margins differ significantly between perishable and non-perishable departments, we conducted an independent samples t-test using IGA departmental sales data.

Hypotheses:

* Null Hypothesis (H₀):  
  There is no significant difference in the average gross profit percentage (GP%) between perishable and non-perishable departments.  
  H0: μ perishable=μ non-perishable
* Alternative Hypothesis (H₁):  
  There is a significant difference in the average GP% between the two department groups.  
  H1: μ perishable ≠ μ non-perishable

Test Results:

* T-statistics: 0.9272
* P-value: 0.378

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**Table 4: T – test analysis report**

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**Fig :1 Box plot analysis chart**

Using a significance level of α = 0.05, the p-value (0.37) is greater than 0.05. Therefore, we fail to reject the null hypothesis.

Conclusion:

There is no statistically significant difference in profitability between perishable and non-perishable departments. However, the box plot shows that perishable categories tend to have more variability and lower median GP%, indicating that while not less profitable on average, they are less consistent and therefore important to manage carefully in any circular economy strategy.

**Profit vs Specials % Share (Linking Profitability and Discounting to Food Waste)**

To support our objective of identifying food waste reduction opportunities through circular economy strategies, we conducted a visual quadrant analysis using two key variables:

* Profit ex (actual profitability)
* Specials % share (discount intensity)

This analysis helps us to identify heavily discounted (indicating surplus or nearing expiry) but yielding low profits (inefficient or loss-making) products, which are ideal for circular economic interventions and dynamic pricing.

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**Figure :2 Bubble chart reports**

Key observations and findings:

* Top-left departments (high profit, low discounts) are strong performers and likely have efficient inventory turnover and pricing.A screenshot of a computer

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**Table : 5 (high profit, low discounts products)**

* Bottom-right departments show low profit but high discounting, signaling potential overstock or unsold perishables a major contributor to food waste.

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**Table 6 : Low profit high discounts products**

* Frozen foods, confectionery, or pet food suggest the need for waste-preventive actions in these zones.

Here, circular strategies like donation of unsold perishables, better shelf-life tracking, or promotional reform can help reduce food waste without compromising overall profitability.

**Predictive analytics (preparing annual report)**

Since our IGA dataset covers just one month from a single store, we created a yearly projection to:

1. Benchmark IGA’s performance against Woolworths and Coles, despite limited access to category-level annual data on food waste.
2. Show how one store’s trends can scale across IGA’s 1,301 locations.
3. Provide a basis for actionable, network-wide circular economy recommendations.

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Our annualized analysis of Valley IGA suggests the store could generate approximately $2.74 million in total annual sales and over $689,000 in annual profit (based on average monthly figures). However, the data shows a high standard deviation in both sales and profit across departments, reflecting major inconsistencies in performance and potential waste.

The average Specials % share is 18.23%, with some departments discounting over 50% of their stock. This high level of markdowns, particularly in perishable or low-margin categories, signals risks of excess stock, poor demand forecasting, or food nearing expiry, all of which align with circular economy concerns.

If these inefficiencies persist across IGA’s 1,301 stores, the cumulative impact could be significant, both financially and environmentally. These projections highlight the urgent need for waste-minimization strategies such as improved stock rotation, predictive ordering, and donation programs. By addressing these issues at the department level, IGA can scale improvements across its national footprint and move toward more sustainable, circular operations, closing the gap with competitors like Woolworths and Coles.

**Comparison analysis:**

We extended our research by comparing IGA’s performance with Woolworths and Coles by extracting useful information from their respective 2024 sustainability reports. A detailed table is provided in Appendix 3. We examined key indicators such as revenue, waste diversion rates, and emissions reduction percentages, and performed a gap analysis to observe the performance differences between IGA and its centralized competitors. This provided us with deeper insights into the systematic challenges faced by IGA due to its decentralized model, particularly in implementing food waste reduction and circular economy initiatives.

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Fig : Chart showing comparison analysis

Due to data limitations of Coles retail, we failed to take it in waste diversion and emissions reduction analysis

Observations:

* IGA (Metcash) lags behind its competitors in waste diversion, achieving only 66%, compared to over 80% by Woolworths. This highlights the need for IGA to adopt stronger reuse and redistribution strategies, such as expanding food donation programs, implementing recovery initiatives, and collaborating more actively with donation agencies. Additionally, improving the turnover of low-selling perishable products by integrating with online retail platforms like Amazon, DoorDash, or Uber Eats could be a highly effective circular economy strategy to reduce food waste and enhance sustainability.
* IGA reports the lowest revenue among the major retailers, reflecting the scalability limitations of its decentralized structure. To address this and move toward greater sustainability, IGA could focus on empowering individual store managers with circular economy training, implementing AI-driven demand forecasting, and incentivizing local surplus redistribution. These strategies can help reduce food waste at the source while promoting a more adaptable and sustainable retail model tailored to IGA’s unique operational setup.
* IGA lags slightly behind its competitors in emissions reduction, indicating a need for stronger environmental control systems. To become more environmentally responsible, IGA should consider adopting store-level energy monitoring, eco-friendly refrigeration systems, and sustainable packaging practices. These initiatives could form an effective strategy to lower emissions, reduce operational waste, and align with broader circular economy goals.

**Recommendations:**

* It is necessary to standardize food rescue partnerships by establishing consistent donation protocols via OzHarvest, SecondBite, etc.
* Implement centralized waste tracking to monitor inventory movement, markdowns, and disposal rates.
* Set a fixed waste diversion KPI and train staff on expiry control, donation eligibility, and shelf-line planning.
* Use sensor tracking systems not only on low-selling perishable products but also on fast-selling items, identifying which shelf rows customers are selecting from. Rotate products based on expiry dates, focusing on those specific shelf areas. This will not only reduce waste but also significantly increase the overall store's profitability and revenue.
* Analyze adjustment reports (based on out-of-date, dumped, damaged, or corrected products) and compare them with store sales data on a fortnightly or monthly basis. This will help identify high-risk fast-selling or low-selling products, contributing to reduced food waste.
* Customer awareness programs should also be organized, encouraging customers to buy near-expiry products. Display photos and videos in-store showing how donated meals and food help those in need, ultimately enhancing IGA’s image positively among customers.

So, if we apply all these circular economy strategies, it will not only help reduce food waste and increase the diversion rate but also improve the overall profitability of the store while building strong trust between customers and retailers.

**Conclusion**

This report has highlighted the implementation of circular economy (CE) strategies in the decentralized structure of IGA supermarkets to mitigate food waste and improve overall operational sustainability. The sales data of one IGA store has been analyzed and the trends have been compared across 1,301IGA stores. Various inefficiencies like discounting behavior, gross profit margins, and management of perishable products have been identified.

In departments with low margins and high discount intensity significant food waste has been witnessed due to inconsistent markdown strategies, and ineffective waste diversion protocol. Competitors like Coles and Woolworths stand out in this context due to the coordinated CE practices, while IGA struggles due to decentralized structure and store-level autonomy.

Various statistical tools such as descriptive analytics, correlation matrices, and t-tests have been used to analyze the data and found that high-volume, low-margin departments are top contributors to food waste. This research highlights the perishable categories of IGA vary greatly and thus require effective waste management strategies.

To conclude, this report argues that although IGA's decentralized approach presents structural problems, it also allows for agile, store-level innovations in waste management. By using digital tools, establishing common CE standards, and equipping store managers with relevant training and resources, IGA can be brought into alignment with national food waste reduction objectives, and in doing so improve the profits, brand, and eco-credentials of its franchisees.

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Appendix:1

**IGA sales report:**

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A close-up of a paper

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2. **Sample data report for annual predicted report**

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**3. Extracted data report from sustainability reports**

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A graph showing the number of individuals

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