International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Barriers and Enablers to HACCP Implementation in Food Processing Small and Medium Enterprises in Southern Africa: A Scoping Review of Challenges and Opportunities for Food Safety Enhancement

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Abstract

Food safety is still a major public health issue worldwide with foodborne diseases affecting about 600 million people and causing more than 420,000 deaths every year. Small and medium enterprises (SMEs) are the main players in the food processing industry in Southern Africa and play a significant role in employment, poverty reduction, food security and economic development. However, despite their contribution to the food safety management system in Southern Africa, a lot of SMEs are not equipped to implement internationally recognized food safety management systems such as Hazard Analysis and Critical Control Point (HACCP). HACCP is widely recognised as a good preventive strategy for food safety, product quality improvement, and access to domestic and international markets, yet it is still being implemented in the low-resource-rich SMEs in Southern Africa in a very different way. This scoping review is based on the existing empirical evidence on the barriers and benefits of implementing HACCP on food processing SMEs in Southern Africa. The review was conducted in a systematic manner according to international reporting guidelines. Electronic databases were searched through PubMed, Scopus, Web of Science, African Journals Online (AJOL) and Google Scholar as well as relevant grey literature from the Food and Agriculture Organization (FAO), World Health Organization (WHO), Southern African Development Community (SADC) and government agencies. After screening and eligibility evaluation, 36 studies were included and the study was considered thematically. There were several common themes which were identified in the review, including poor financial resources, poor infrastructure, insufficient technical knowledge, low HACCP awareness, poor enforcement of the regulations, weak management and lack of trained staff. On the other side, successful HACCP implementation was supported by leadership commitment, continuous training of staff, government support, technical assistance, certification incentives, donor-funded programmes and partnerships with public institutions and industry. Different countries exhibited significant differences in governance, institutional capacity and economy. The review found that sustainable implementation of HACCP in food processing SMEs is an integrated process that requires regulatory reform, financial support, technical capacity building and institutional development. Enhancing food safety governance in Southern Africa would bring better protection of consumers and in turn enhance the competitiveness of SMEs and regional food security. The results

provide evidence-based recommendations for policymakers, the regulatory authorities, development agencies and SME managers as to what are the next steps for further research.

Keywords: HACCP; Food Safety; Small and Medium Enterprises; Southern Africa; Food Processing; Scoping Review; Foodborne Diseases; Quality Management

1. Introduction

Quality Management Food safety is one of the most significant public health and economic challenges of the twenty-first century. Rapid population growth, urbanisation, globalisation of food supply chains and changing consumer preferences have drastically increased the complexity of food production and distribution systems. Those developments have improved food availability but they have also created opportunities for microbial, chemical and physical contamination along the food chain. As a result, food safety is a priority for governments, international organisations, food industries and consumers worldwide (World Health Organization [WHO], 2022). About 600 million people worldwide suffer foodborne illnesses each year - about one in every ten people in the world - with nearly 420,000 people dying as a result of unsafe food consumption (WHO, 2022). Children under five years are responsible for nearly one-third of these deaths, representing a fraction of the world population.

Foodborne diseases also have a large economic impact by cost of healthcare, productivity loss, food recalls, trade barriers and loss of consumer confidence (Jaffee, Henson, Unnevehr, Grace, & Cassou, 2019). The burden of foodborne diseases is particularly acute in low- and middle-income countries with significant institutional, infrastructural and financial barriers to food safety. In many African countries, the demand for processed food has grown rapidly and regulatory bodies are in short supply of food safety professionals due to the shortage of laboratory space and trained food safety professionals (Food and Agriculture Organization [FAO] & WHO, 2023). As a result, unhealthy food is still threatening public health, economic development and international trade in Africa. Southern Africa is one of the most influential regions to study food safety in our context.

It has many economies with growing agro-processing and manufacturing industries, urban food demand and the increased participation of small and medium enterprises in food production and distribution. SMEs are the backbone of many Southern African economies, generating large numbers of jobs, household income and food supply. Thus, many SMEs are operating in a resource-poor environment as they have little investment in capital, a lack of technical expertise, and lack of access to modern food safety technologies (FAO, 2019). One of the most well-known approaches to prevent food contamination is the Hazard Analysis and Critical Control Point (HACCP) system. HACCP was implemented in the United States space programme during the 1960s and has been adopted internationally through the Codex Alimentarius Commission (Codex Alimentarius Commission, 2023). HACCP is a preventive, science-led food safety management system that identifies the risk of food contamination from the very start (and it doesn't only rely on inspections of finished products, but rather the safety evaluation of all food products). The system is based on seven internationally accepted principles: hazard analysis, critical control points (CCPs), critical limits, monitoring, corrective actions, verification and documentation. HACCP has been established as the global standard for food safety management during the last 30 years in the world. International organisations like Codex Alimentarius Commission, FAO and WHO have proposed that HACCP is a key component of modern food safety systems as it prevents biological, chemical and physical hazards before they can compromise the health of consumers (Codex Alimentarius Commission, 2023;

Mortimore & Wallace, 2023). Most importing countries also require HACCP certification as a prerequisite to trade food products internationally through the food industry, which is why it is now very important for companies to take advantage of the available food safety measures and regulations in order to access the international market in both local and global markets. HACCP is also a good system that provides organisational benefits as well as good and reliable organisations with a lot of them.

The evidence is clear that HACCP has been found to improve product quality, lower product recalls, better operational efficiency, better customer confidence and better brand reputation and a competitive edge in the domestic market and export markets (Mortimore & Wallace, 2023). HACCP implementation also increases employee awareness of food safety, process control and continuous improvement of the organisation. However, implementation of HACCP is often difficult for SMEs. SMEs are typically less financially well-equipped than large multinational food producers, with limited investment and technical capacity, and therefore face a lot of obstacles to the implementation of a complete food safety management system.

These include limited access to finance, training of employees, lack of trained food safety workers, lack of management commitment, poor infrastructure, little laboratory capabilities and weak institutional support (Taylor, 2022). SMEs often consider HACCP to be a complex, painful and expensive initiative that is only relevant to export-oriented businesses and not to the domestic food industry. In Southern Africa, these challenges are often magnified by the socio-economic and institutional conditions. Many countries have economic instability, inflation pressures, inconsistent regulatory enforcement and no investment in food safety facilities.

As a result, many food processing SMEs are still struggling to comply with national food safety standards while maintaining business viability in highly competitive markets (Macheka et al., 2018). Lack of technical extension services and fragmented regulatory frameworks and weak collaboration between government agencies, industry associations and academic institutions also hinder the adoption of HACCP across the region. Although there have been numerous empirical studies on HACCP implementation globally, the evidence is relatively scattered across countries and food sectors. Most of the published reviews are based on developed economies or specific food industries, and thus poorly understand the unique challenges faced by Southern African SMEs.

Furthermore, there are many studies that investigate the local context of a single barrier but never focus at the structural, financial, technical, institutional and behavioural factors that influence the implementation of HACCP in a resource-poor context. This leaves policymakers, development practitioners and SME managers without sufficient evidence to make specific interventions to improve food safety in Southern Africa. A scoping review is an appropriate way to fill this knowledge gap as it is an efficient way to map existing research evidence, identify trends in research and synthesis of evidence based on different research findings and identify areas that need further study. Unlike systematic reviews that assess narrowly defined interventions, scoping reviews are able to address more general research questions and study designs because of the diversity of evidence sources, which is particularly relevant in new research areas in the Southern African context (Peters et al., 2020).

Therefore, this review synthesises the evidence regarding barriers and enablers to HACCP implementation within food processing SMEs in Southern Africa. By studying data from various countries and food sectors in depth, a systematic review will help to develop evidence to inform policy change, institutional strengthening, capacity-building and future research. Enhancing HACCP implementation amongst food

processing SMEs is therefore the first step towards food safety, public health, enterprise competitiveness, and sustainable economic development in Southern Africa.

2. Problem Statement

Food processing SMEs are a key component of Southern Africa's agri-food system, yet many are still operating without fully functional HACCP-based food safety management systems in the face of increasing regulatory pressure and consumer demand for safe food products. A poor implementation of HACCP leads to the persistent problem of food contamination, restricts access to high-value domestic and export markets, low consumer confidence and weak competitiveness of enterprise. While research has identified limited barriers such as financial constraints and poor training and enforcement, the evidence is fragmented between countries and food sectors. When it comes to supporting and enabling these barriers in the Southern African context, the evidence base is weak. Therefore, the policies, regulators and SME managers do not have the evidence base to design effective policy interventions to help in the adoption of sustainable HACCP and to improve regional food safety systems.

3. Research Gap

HACCP has been widely investigated worldwide but few reviews have been produced on the subject of food processing SMEs in Southern Africa. The literature in this field is mainly focused on developed countries where regulatory environment, institutional capacity and financial resources are very different from those in Southern Africa. Also, previous works have been based on individual countries and specific food sectors and have not provided a regional perspective. There is also limited analysis of both barriers and enabling factors in a single review. These gaps need to be filled to make context-specific recommendations for improving food safety governance, SME competitiveness and evidence-based policy making in Southern Africa.

4. Materials and Methods

4.1 Study Design

This study employed a scoping review method to systematically assess the strengths and weaknesses of the evidence and to map and synthesize the barriers and enablers in the implementation of Hazard Analysis and Critical Control Point (HACCP) systems among food processing SMEs in Southern Africa. A scoping review was the most suitable methodology since the literature is heterogeneous in terms of study design, food sectors, geographical settings and reported results across different areas. Unlike systematic reviews, which mainly focus on a specific set of intervention effects, scoping reviews are intended to examine the wealth of available evidence, highlight research gaps and provide insight into new topics (Arksey & O'Malley, 2005; Peters et al., 2020; Tricco et al., 2018). The study was based on the methodology developed by Arksey and O'Malley (2005), and also refined by Levac, Colquhoun and O'Brien (2010) according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines (Tricco et al., 2018).

4.2 Review Question

The review was guided by the following primary research question:

What barriers and enablers influence the implementation of HACCP systems among food processing SMEs in Southern Africa?

The review also addressed the following subsidiary questions:

1. What structural, financial, technical and institutional barriers limit HACCP implementation?
2. Which organisational, managerial and policy-related factors facilitate successful HACCP implementation?
3. How do barriers and enablers differ across Southern African countries and food processing sectors?
4. What evidence-based recommendations emerge for strengthening food safety management in resource-constrained SMEs?

4.3 Eligibility Criteria

As suggested by the Joanna Briggs Institute for scoping reviews, eligibility criteria were developed using the Population-Concept-Context (PCC) framework.

Population

The review covered studies of small and medium enterprises (SMEs) in food processing. SMEs were defined according to national or regional definitions in general, which are those businesses with fewer than 250 employees or equivalent turnover levels.

Concept

The review focused on studies examining:

- HACCP implementation
- Food safety management systems
- HACCP barriers
- HACCP challenges
- HACCP enablers
- HACCP facilitators
- Food safety compliance
- Food safety certification

Context

Only studies conducted within Southern African countries were included, namely:

- Zimbabwe
- South Africa
- Zambia
- Botswana
- Namibia
- Malawi
- Lesotho
- Eswatini
- Mozambique
- Angola

Inclusion Criteria

Studies were eligible if they:

- investigated HACCP implementation within food processing SMEs;
- reported barriers, challenges or enabling factors;
- were conducted in Southern Africa;
- were published in English;
- included qualitative, quantitative, mixed-methods, case study or policy research;

- were published in peer-reviewed journals or recognised institutional reports.

Exclusion Criteria

The following studies were excluded:

- studies involving only large food manufacturing companies;
- studies conducted outside Southern Africa;
- conference abstracts lacking sufficient methodological detail;
- editorials, opinion papers and commentaries;
- duplicate publications;
- studies focusing exclusively on primary agricultural production without food processing.

4.4 Information Sources

A comprehensive literature search was undertaken across multiple electronic databases to maximise coverage of published evidence.

The following bibliographic databases were searched:

- PubMed
- Scopus
- Web of Science
- African Journals Online (AJOL)
- Google Scholar

To minimise publication bias, relevant grey literature was also searched, including publications from:

- World Health Organization (WHO)
- Food and Agriculture Organization of the United Nations (FAO)
- Codex Alimentarius Commission
- Southern African Development Community (SADC)
- National food safety authorities
- Government ministries responsible for agriculture and public health
- International development organisations

4.5 Search Strategy

A structured search strategy combining Medical Subject Headings (MeSH) and free-text keywords was developed.

Search terms included combinations of:

- "Hazard Analysis Critical Control Point"
- HACCP
- food safety
- food processing
- food industry
- food manufacturing
- small and medium enterprises
- SMEs
- barriers
- challenges
- facilitators

- enablers
- implementation
- Southern Africa
- Zimbabwe
- Zambia
- Botswana
- Namibia
- Malawi
- Lesotho
- Eswatini

Boolean operators (AND and OR) were used for search improvement. A typical search string was: ("HACCP" OR "Hazard Analysis Critical Control Point") AND ("food processing" OR "food manufacturing") AND ("SMEs" OR "small and medium enterprises") AND ("Southern Africa" OR Zimbabwe OR South Africa OR Zambia OR Botswana OR Namibia OR Malawi OR Lesotho OR Eswatini). As well as finding reference lists of all the eligible articles, the authors also manually screened for other relevant papers that were not retrieved in database searches.

4.6 Study Selection

The retrieved records were exported to reference management software to identify duplicate records and delete them from the database before the research was completed. The selection process consisted of four stages:

1. Identification of records.
2. Removal of duplicate publications.
3. Screening of titles and abstracts.
4. Full-text eligibility assessment.

Removal of duplicate publications. Screening of titles and abstracts. Full-text eligibility evaluation. As a result of the review process, 845 records were identified. After deleting 210 duplicates, 635 records were screened for title and abstract. 80 full-text studies were selected and 36 of them met all the inclusion criteria and were included in the final review. The study selection process is illustrated in the PRISMA flow diagram.

4.7 Data Charting and Extraction

A standardized data extraction form was developed to ensure consistency during evidence synthesis. The following information was extracted from each study:

- Author(s)
- Year of publication
- Country
- Study design
- Food processing sector
- Sample characteristics
- Objectives
- Barriers identified
- Enablers identified
- Principal findings

- Recommendations

Data extraction was independently verified to minimise transcription errors and enhance consistency throughout the review.

4.8 Data Analysis and Synthesis

Extracted evidence was analysed using thematic analysis, an approach well suited to synthesising heterogeneous qualitative and quantitative evidence.

The analysis followed six iterative stages:

1. Familiarisation with extracted evidence.
2. Initial coding of recurring concepts.
3. Development of preliminary themes.
4. Review and refinement of themes.
5. Definition and naming of themes.
6. Narrative synthesis and interpretation.

The identified themes were organised into two overarching categories:

Barriers to HACCP implementation

- Financial barriers
- Technical barriers
- Human resource barriers
- Infrastructure limitations
- Regulatory and institutional barriers
- Organisational and cultural barriers

Enablers of HACCP implementation

- Leadership commitment
- Staff education and training
- Government support
- Technical assistance
- Certification incentives
- Public–private partnerships
- Donor support
- Continuous improvement practices

Subsequently, the results were compared across countries and food sectors to further assess similarities, differences and emerging regional trends.

4.9 Quality Considerations

While formal critical assessment is not mandatory for scoping reviews, the quality of the evidence was considered in the evidence interpretation process. The emphasis was placed on studies that were clearly defined objectives, well-defined aims, robust methods, transparent analysis and evidence based (Peters et al., 2020). The impact of publication bias, geographical concentration of studies and different SME definitions were considered when interpreting the findings.

4.10 Ethical Considerations

The research used literature available in the public domain so the ethical approval was not needed. However, the review was compliant with the established standards of research integrity and the recognition of all sources and the avoidance of plagiarism, selective reporting and the misrepresentation of data. This

review also followed internationally accepted standards for the synthesis of evidence and scholarly reporting (Committee on Publication Ethics [COPE], 2023).

4.11 Reporting Standards

The review was designed in terms of the PRISMA-ScR reporting checklist (Tricco et al., 2018) so that literature identification, study selection, data extraction and evidence synthesis are done in a transparent manner. Adherence to the reporting standards will ensure that the review is reproducible and credible and as an international comparison with similar food safety reviews is made with confidence.

5. Results

5.1 Overview of Study Selection

The study searched the electronic databases and grey literature for 845 records and collected them. After deleting 210 duplicate records, 635 articles were retained for title and abstract screening. After screening, 82 full-text articles were selected according to the criteria for eligibility. Of these, 36 studies met all the criteria and were included in final synthesis. The relatively small number of eligible studies shows that there are fewer studies which focus on the implementation of HACCP in food processing SMEs in Southern Africa. While food safety has received increasing international attention, the evidence is dominated by Europe, North America and Asia, and is not equally representative of South African studies. The outcome of this study further underlines the need for more investments in food safety research in the region.

5.2 Characteristics of Included Studies

The 36 papers included in this study represent different food processing industries and research areas. They collectively provided evidence on the challenges and possibilities for implementation of HACCP for SMEs operating in varying economic, regulatory and institutional frameworks. Most of these studies were published between 2015 and 2025, reflecting growing regional and international interest in food safety management systems amid increased concerns over foodborne disease outbreaks, international trade requirements and consumer protection. Recent studies especially emphasized the need to strengthen preventive food safety systems through risk-based management with Codex Alimentarius (Codex Alimentarius Commission, 2023; FAO & WHO, 2023).

Table 1. Characteristics of Included Studies

Characteristic	Number of Studies	Percentage (%)
Total included studies	36	100
Cross-sectional surveys	16	44.4
Case studies	12	33.3
Mixed-methods studies	3	8.3
Policy and technical reports	5	13.9

The majority of the cross-sectional studies indicate that current knowledge about the implementation of HACCP is based on descriptive surveys and not longer investigations of organisational change over time. This approach is in line with previous reviews of food safety management research (Taylor, 2022).

5.3 Geographic Distribution of Studies

The studies in this study were from seven countries of Southern Africa but there was substantial variation in papers. South Africa has the most publications (12 studies (33.3%), owing to its relatively well-

developed food processing industry, better research resources and more mature industry and regulatory framework for food safety. Zimbabwe contributed six studies (16.7%) while Zambia contributed five (13.9%). Namibia contributed four studies (11.1%) while Botswana and Malawi each contributed three (8.3%) studies. Lesotho had two studies (5.6%) and Eswatini had only one (2.8%). The geographical asymmetry of these research findings indicates some extent of diversity in the research capacity for food safety in Southern Africa. Countries that have little published evidence may still face considerable food safety issues that are not well-covered in the scientific literature. This imbalance limits the impact of evidence-based policymaking on the region and calls for increased research investment in the region.

Table 2. Geographic Distribution of Included Studies

Country	Number of Studies	Percentage (%)
South Africa	12	33.3
Zimbabwe	6	16.7
Zambia	5	13.9
Namibia	4	11.1
Botswana	3	8.3
Malawi	3	8.3
Lesotho	2	5.6
Eswatini	1	2.8

5.4 Food Processing Sectors Represented

The studies that were reviewed include a variety of food processing industries. Mixed food processing enterprises are the largest category (16 studies) and represent the diversity of SME operations in Southern Africa. Meat processing was conducted in eight studies, dairy processing in five studies, bakery production in four studies and grain milling in three studies. The concentration of research in meat and dairy processing was not surprising because these sectors have a high microbiological risk (and are therefore often the first to be investigated by food safety regulators). However, there was relatively limited research in fruit and vegetable processing, beverage production and traditional food business sector considering that they have been growing in importance in South Africa, while food consumption is increasing.

Table 3. Food Processing Sectors

Food Sector	Number of Studies
Mixed food processing	16
Meat processing	8
Dairy processing	5
Bakery	4
Grain processing	3

5.5 Thematic Analysis of Barriers to HACCP Implementation

Thematic analysis identified six major categories of barriers consistently reported across the reviewed literature.

5.5.1 Financial Constraints

The most frequently reported obstacle to implementing HACCP is financial limitations. All research studies indicated that most SMEs had a difficult time accessing financial resources for infrastructure upgrades, equipment acquisition, employee training, laboratory testing and certification. Many organizations considered it expensive to implement HACCP as the implementation process is not an immediate one but a continuous process. Initial implementation costs are for upgrading processing facilities, purchasing monitoring equipment, developing documentation systems and training employees to do such activities. Ongoing costs include microbiological testing, internal audits, external certification, maintenance of equipment and periodic staff training (Mortimore & Wallace, 2023). In Zimbabwe, Zambia, and Malawi, several studies noted that SMEs put immediate operations first over long-term food safety systems because of cash flow constraints, inflationary pressures and limited access to affordable credit. The financial difficulties often delayed or even prevented the implementation of HACCP.

5.5.2 Inadequate Infrastructure

Infrastructure deficiencies were also a major hurdle identified in studies in most of the reviewed areas. Many SMEs operated from outdated facilities with poor building design, inadequate water supplies, unreliable electricity, insufficient waste disposal systems and poor cold chain infrastructure. These deficiencies also affect the compliance of the HACCP implementation programme in the sense that Good Manufacturing Practices (GMPs), sanitation programmes and environmental hygiene should be implemented. It has always been acknowledged that HACCP implementation cannot be successful without adequate physical infrastructure for hygienic food production. This is especially true in rural processing industries where reliable energy and modern processing facilities are scarce.

5.5.3 Limited Technical Knowledge and Skills

Insufficient technical expertise was one of the most frequently cited human resource problems. SME owners, managers and food handlers also had a very poor understanding of HACCP principles, hazard analysis, critical control point identification and documentation. Employees were frequently trained in food processing but had no experience of food safety. As a consequence, HACCP was viewed as a complex regulatory procedure and not as a practical risk management system that could improve organisational performance. Limited training also led to poor record keeping, inconsistent monitoring and ineffective verification of the system, making HACCP systems less effective.

5.5.4 Weak Regulatory and Institutional Support

Weak Regulatory and Institutional Support. In addition, inconsistent regulatory enforcement limited HACCP acceptance in many Southern African countries. Numerous studies reported fragmented food safety governance which included overlapping institutional mandates, inconsistent inspections and poor technical guidance for SMEs. Regulatory authorities were often unable to provide ongoing extension services and technical mentoring as well as compliance monitoring. SMEs had little real assistance during implementation of HACCP as regulations went up. The differences in national food safety regulations also complicated regional harmonisation of food safety standards and could also affect cross-border trade within the Southern African Development Community (SADC).

5.5.5 Organisational and Management Barriers

Management commitment was also a major organisational determinant in the implementation of HACCP. Research consistently found that organisations where senior management was more involved in food safety initiatives were more successful in the implementation process than those where management

considered HACCP purely as a regulatory duty. Lack of leadership commitment, in turn, resulted in insufficient resources, low employee motivation and weak food safety culture in organisations.

5.5.6 Cultural and Behavioural Challenges

Employee attitudes and organisational culture also influenced HACCP implementation. Resistance to organisational change, low awareness of food safety risks and reluctance to adopt new procedures frequently limited implementation success.

Some enterprises reported that experienced employees preferred traditional production practices and viewed HACCP documentation requirements as unnecessary administrative burdens. These behavioural challenges underscore the importance of organisational learning, continuous communication and leadership support during implementation.

5.6 Summary of Major Barriers

Across all included studies, the principal barriers identified were:

- inadequate financial resources;
- poor infrastructure;
- insufficient technical knowledge;
- inadequate employee training;
- weak regulatory support;
- limited management commitment;
- poor food safety culture;
- shortages of qualified food safety personnel;
- limited laboratory services;
- inadequate access to technical assistance.

These barriers frequently occurred simultaneously, suggesting that successful HACCP implementation requires integrated rather than isolated interventions.

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