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IMPACT OF AGRO-PROCESSING AMONG SMALL-SCALE FARMERS IN SUB-SAHARAN AFRICA: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

The potential of agro-processing among farmers in Sub-Saharan Africa (SSA) is immeasurable. Its effects range from the improvement of livelihoods to stimulating commercial agriculture. This research aimed to examine the impact of agro-processing among rural smallholder farmers in SSA, identifying specific themes based on regional influence, contemporary trends, technology and innovation, research methodologies, and existing gaps. This study is based on a Systematic Literature Review of 20 articles selected from a pool of 93 scientific documents focused on agro-processing and its impact on farmers, especially smallholder farmers in rural SSA. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology was applied to select articles from the Web of Science database. The findings showed that in 50% of the studies reviewed, the income effect was the most significant factor, followed by market effects with varying degrees of impact, farmer groups in the form of cooperatives, and profitability as an indicator of price-driven value enhancement, all of which were prominent among smallholder farmers and along the value chains. Agribusiness and agro-processing development also benefit from complementary factors, such as technological innovation like the use of nanotechnology in the agri-food industry, training, extension services, and information sharing that directly influence product quality, shelf-life extension, food safety and security, postharvest management, and biofortification for nutritional improvement in food products. Emerging trends in commercialization, farmers' welfare, and policy reforms highlight the need for sustainable value chain activities. The impact of agro-processing spreads along the value chain stakeholders, underscoring the need for formal systems and solid market integration. Future research should be conducted on livestock products targeting individual countries in the region based on empirical analysis using mixed methods.

Keywords: agribusiness, smallholder farmers, income, value-addition, sustainable
JEL Code: Q13, Q18

INTRODUCTION

Subsistence operations dominate food systems in Sub-Saharan Africa (SSA), marked by low productivity, smallholder farmers, short supply value chains with limited agri-food processing, and minimal use of quality agricultural inputs *(Augustin & Cole,* 2022). The SSA region earns limited income from agriculture due to inadequate use of modern technology, low yields, and low-income levels, hindering the timely

attainment of United Nations Sustainable Development Goals (especially SDG 1, SDG 2, and SDG 8). SDG 1 aims to eradicate poverty through social protection, improved living standards above 1.90 dollars per day, and equitable access to economic resources, finance, and technology. SDG 2 focuses on ending global hunger through sustainable farming, eradicating malnutrition, increasing agricultural productivity, and improving nutrition and food security. SDG 8 promotes decent work and sustainable economic growth through innovation, job creation, enterprise development, and entrepreneurship in a safe environment (*Pawlak & Kołodziejczak,* 2020; *AfDB*, 2016). The region is experiencing rapid urbanization, leading to increased demand for industrialized processed agri-food products, which stimulates importation instead of local procurement (*Gutu,* 2023). Rural agro-processing has been recognized by the Food and Agriculture Organization (FAO) of the United Nations (UN) as a way to address food insecurity in SSA. The advantages of smallholder agro-processing aid in stabilizing food prices and creating employment among locals and value chain actors as a source of income in activities ranging from packaging, storage, branding, marketing, and distribution (*UNCTAD*, 2017). This research aims to determine the significance of agro-processing among smallholder farmers in SSA and the research methodologies used on related topics through a Systematic Literature Review method. Therefore, this study aims to answer the following research questions:

1. How does agro-processing impact smallholder farmers in Sub-Saharan Africa?
2. What research methodologies have been used by other authors on relevant topics?

MATERIALS AND METHODS

Preferred Reporting Items for Reviews and Meta-Analyses

The study used relevant scientific articles from the Web of Science database (WoS). Web of Science is one of the leading databases for scientific articles from leading publishers and is widely used in top-tier systematic review journals (*Christofi et al.,* 2021). The WoS database was preferred over SCOPUS as it had longer historical data. Most of the SCOPUS data were duplicates of those from WoS. The WoS initial search yielded 90 articles from 1995 to 2023, while SCOPUS had 61 documents from 2005 to 2023 for SSA countries, based on English language publications, and the specified search words and phrases. For the analysis of current trends and themes, the articles were restricted to the period 2017 to 2023. The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines due to its robustness in guiding researchers to gather information from various databases within the established protocol and guidelines, thus eliminating bias in their research work (*Harris et al.,* 2014; *Rethlefsen et al.,* 2021). *Miranda et al.* (2023), *Borda et al.* (2023), and *Stewart et al.* (2023), are some of the studies that used fewer than 100 documents for their analyses using the Systematic Literature Review methodology. This method is recognized for its strength in answering predefined research questions and providing comprehensive results. This study followed the latest PRISMA flow model for clarity and accurate reviews based on identification, screening, and inclusion criteria using a 27-item evidence-based checklist for

reporting (*Page et al.,* 2021). This process is straightforward and user-friendly, as illustrated in *Figure 1*.

Article Identification

Following PRISMA guidelines, the first step was to develop search criteria to strategically identify relevant research articles from the Web of Science database. Web of Science was chosen because more high-quality articles were found during a preliminary database search compared to SCOPUS. The database contained reliable articles specific to the topic and aligned with the search keywords, making the sample size sufficient to carry out the study (*Phethean et al.,* 2016*; Gusenbauer & Haddaway,* 2020). The search strings were constructed from the TS (topic – comprising the titles, abstracts, and keywords) using the advanced search option of WoS. (*Aguinis & Glavas,* 2012; *Xiao & Nicholson*, 2013; *Pisani et al.,* 2017). The Boolean 'AND' combined the study sector keywords, entry and exit level opportunities, and the underlying factors while 'OR' was used to broaden the search by including related terms and synonyms (*Pranckutė,* 2021). The first set of keywords depicted the effect and included words like („impact" OR „benefit" OR „advantages" OR „disadvantages" OR „merits" OR „demerits" OR „influence" OR „effects"). The second set of words focused on the activity and included words such as („crop processing" OR „livestock processing" OR „agricultural processing" OR „agricultural product transformation" OR „agricultural product value addition" OR „value-addition"). The last set of keywords was related to the target group and included words such as („farmers" OR „small-scale farmers" OR „smallholder farmers" OR „rural farmers").

Article Screening

The identified articles from the Web of Science database were subjected to a screening process based on the publication year (2017-2023), source type (journal), document type (articles and review articles), and language (English). The publication year was relevant to ensure coverage of all calendar years within the specified period. The first search yielded 93 publications. Upon refining articles published between 2017 and 2023, 74 documents appeared.

Inclusion and Exclusion

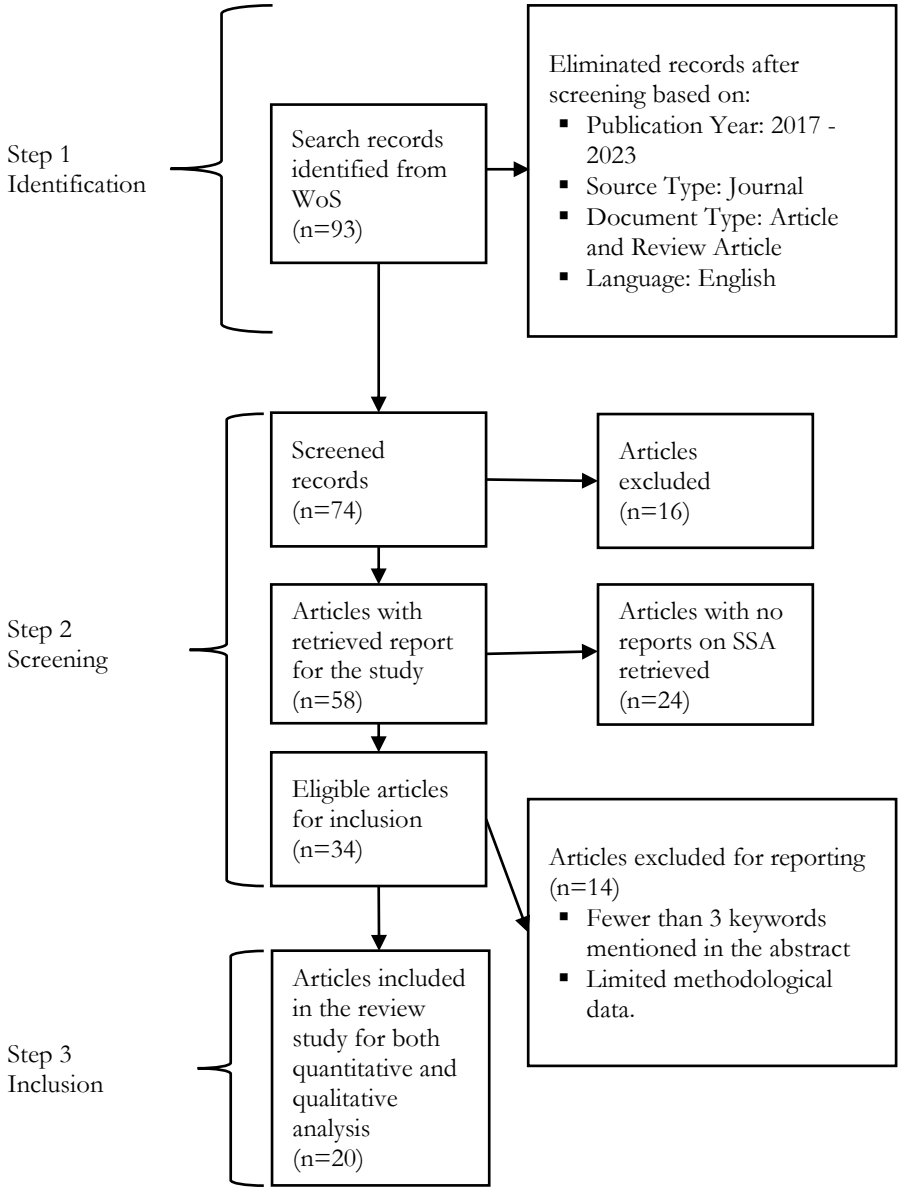
The 74 documents retained from article screening were subjected to a thorough review, excluding 16 articles with irrelevant titles and limited information in the abstracts. Further assessment of the retained 58 papers led to the exclusion of 24 articles due to limited information about the countries of interest in SSA. The remaining 34 documents were narrowed down to 20 articles after excluding 14 papers with limited methodological details. The final 20 articles were included for the study after careful and thorough reassessment.

Data Analysis

The data analysis was conducted using the retrieved documents' WoS metadata details, which included their publication year and source of the journal, and identified

the effects of agro-processing. Microsoft Excel was used to summarize data from 20 documents and systematically capture the potential effects of agro-processing on rural farmers. This study was restricted to scientific journals published between 2017 and 2023. The articles were organized in columns according to the cited references, highlighted impact, and identified broad themes for further analysis.

Figure 1: PRISMA Flowchart



Source: Based on *Page et al.* (2021)

RESULTS AND DISCUSSION

The study is based on a qualitative inquiry focusing on journals retrieved from the Web of Science, which was selected for its high-quality scientific research papers. The study focused on publications conducted from 2017 to 2023 that have an identifiable influence on agro-processing among smallholder farmers.

Descriptive Analysis

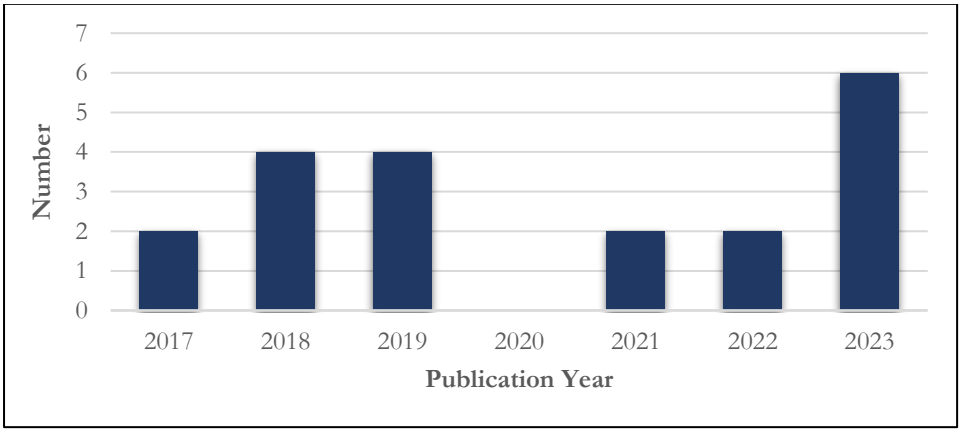
This study included 20 articles published between 2017 and 2023. The trend shows an increasing interest in agro-processing research, especially its impact on farmers. Areas of focus on the descriptive analysis included the research methodologies, journal quality, publication distribution by year, country, value chain based on product and service, and possible contemporary trends in agro-processing activities.

Research Trends

This section presents the graphical overview of the research trends from *Figure 2 to Figure 5B* of the analysed articles.

Figure 2 depicts the trends in agro-processing publications since 2017. There was a steady rise from 2017 to 2019, but a significant drop occurred in 2020, likely due to the COVID-19 pandemic. During this time, researchers shifted their focus to pandemic-related topics, including healthcare management, economic disruptions, and food supply chain issues, particularly in African nations affected by the agricultural crisis. From 2021 to 2022, publication rates remained moderate, but in 2023, interest in agro-processing surged once again.

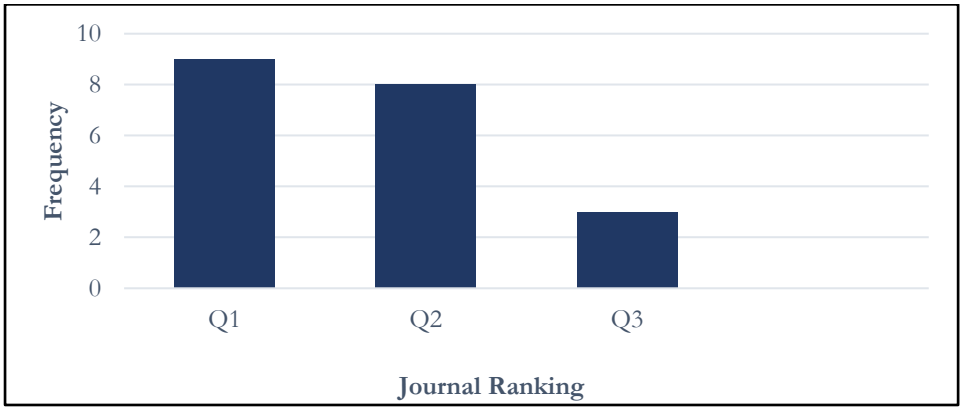
Figure 2: Number of Publications per Year



The *Figure 3* illustrates the distribution of journal quality according to Scimago Journal Rank (SJR) categories. The majority of the reviewed publications are found in Q1 and Q2 journals, reflecting a high standard of scientific research. Only three papers were published in Q3-ranked journals, reinforcing the credibility and

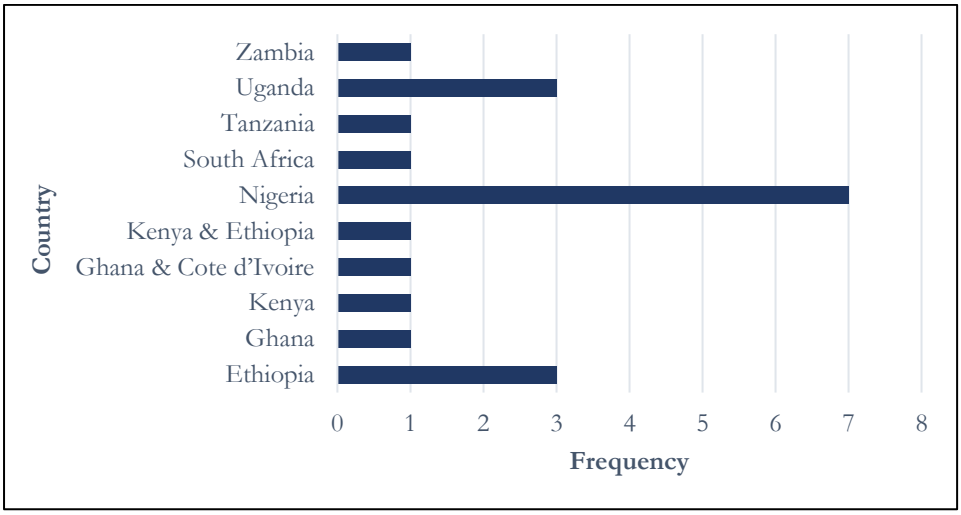
relevance of the chosen literature. This underscores the robust academic foundation that supports the study's findings.

Figure 3: Quality of Journals and Ranking



The *Figure 4* illustrates the distribution of agro-processing publications by country. Most studies originated from Nigeria, followed by Ethiopia and Uganda, while the RSA, Kenya, Ghana, Tanzania, and Zambia contributed fewer papers. This regional variation not only highlights differences in research capacity and investment but also reflects the structural characteristics of each country's agriculture. Nigeria and Ethiopia, with their diverse and commercially oriented agricultural sectors, regard value addition and agro-processing as vital to their agrarian economies. Conversely, countries with agriculture primarily focused on basic production tend to conduct less research on agro-processing activities.

Figure 4: Distribution of Articles by Country

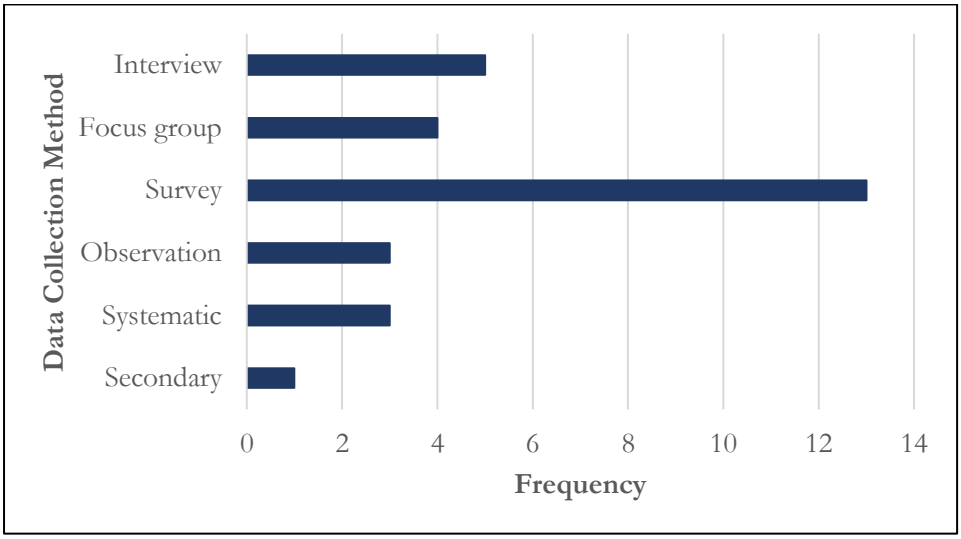


Data Collection Methodologies

Various data collection tools and methods were applied in the reviewed scientific articles. Some studies used single tools, whereas others used mixed methods. Most studies conducted structured and semi-structured surveys for data collection. The survey was used in eight articles, followed by interviews in 5 articles; 4 used focus group discussion (FGD), 3 studies used observation, and a systematic review was used in 3 studies. Lastly, secondary data modelling was done in one paper. Overall, as shown in *Figure 5A* and *Figure 5B*, most studies used a mix of data validation and reliability methodologies.

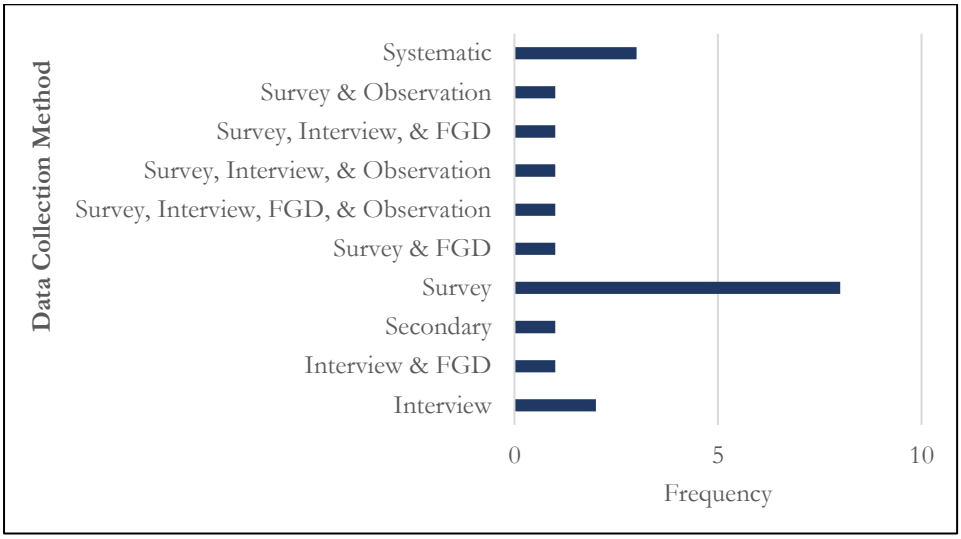
The *Figure 5A* illustrates how often different data collection methods were used in the reviewed studies. The most frequently employed methods were structured and semi-structured surveys, followed by interviews, focus group discussions, observations, and systematic reviews. This range of data collection techniques enhances the credibility of the findings by promoting data richness and methodological triangulation. Such diversity in methodology strengthens the reliability of the results.

Figure 5A: Frequency of Data Collection Method



The *Figure 5B* offers another perspective on the use of data collection methods in publications. It emphasizes that several studies utilized mixed-methods approaches, combining qualitative and quantitative techniques. This integration enhances the reliability and validity of research findings by providing a comprehensive understanding of the impact of agro-processing. Mixed methodologies also enable a deeper exploration of the complex socio-economic dynamics affecting smallholder farmers.

Figure 5B: Frequency of Data Collection Method



Thematic Analysis

The leading themes captured from the reviewed articles, focusing on the impact of agro-processing on smallholder farmers, include increased income due to value addition and improved product pricing. Value creation in agro-processed products cannot exist independently without considering markets (*Apata et al.,* 2018; *Ashiagbor et al.,* 2019; *Maduka et al.,* 2019; *Fadiji et al.,* 2022; *Kyomugisha et al.,* 2018; *Olajide et al.,* 2021; *Onuekwusi et al.,* 2017; *Tamru & Minten,* 2023). One of the primary benefits that agro-processors realize is access to premium markets resulting from the work of dedicated value chain actors driving sustainable linkages (*Bwalya & Chenjelani*, 2023; *Cheyo et al.,* 2024; *Siankwilimba et al.,* 2023; *Tamru & Minten*, 2023; *Teshale et al.,* 2017; *Wosene & Gobie*, 2022). Access to sustainable markets should be based on information sharing, through local radio or extension services during crop production to meet the required consumer tastes and preferences (*Adeyemo & Okoruwa*, 2018; *Ayetigbo et al.,* 2018; *Juma Okello et al.,* 2018; *Olajide et al.,* 2021). The continuity of sustainability depends on agricultural productivity, which determines the level and mode of agro-processing integration activities along the value chains (*Aboah et al.,* 2021; *Adeyemo & Okoruwa*, 2018). Postharvest management ensures that the quality and safety of agri-food products for consumers and smallholder farmers is achieved, and reduces wastage (*Aboah et al.,* 2021; *Adeyemo & Okoruwa*, 2018; *Aluko et al.*, 2023).

There is an emerging and growing trend in agricultural production linked to agro-processing. The rise of socioeconomic empowerment among smallholder farmers has led to the formation of cooperatives for producers to gain fair prices for their products, secure consistent buyers, and focus on local traders (*Aluko et al.,* 2023; *Cheyo et al.,* 2024; *Onuekwusi et al.,* 2017; *Tamru & Minten*, 2023). Product quality, food safety, longer shelf life, and innovation are vital to agro-processing (*Ayetigbo et al.,* 2018; *Juma Okello et al.,* 2018; *Alalade et al.,* 2019; *Olajide et al.,* 2021). The range of innovation can be as basic as the use of solar dryers to more sophisticated approaches, such as biofortification and the use of nanotechnology to improve product nutritional value and extend shelf life,

respectively (*Kumi et al.,* 2023; *Maduka et al.,* 2019; *Ayetigbo et al.,* 2018; *Juma Okello et al.,* 2018). As part of agricultural commercialization, agro-processing has provided its participants with greater profitability by supporting sustainability initiatives among small-scale rural farmers (*Aboah et al.,* 2021; *Teshale et al.,* 2017; *Wosene & Gobie*, 2022).

To support these initiatives, training and capacity building for rural farming households seem to be gaining traction among development partners, local communities, and peer farmers. Gaining more knowledge in agribusiness has stimulated the need for formal businesses, making the adoption of enterprise registration a priority among smallholder farmers (*Adeyemo & Okoruwa,* 2018; *Bwalya & Chenjelani*, 2023; *Olajide et al.,* 2021). Legal operations attract serious value chain actors in premium markets, including those involved in bulk logistics, established traders, and individuals willing to work directly with producers engaged in agro-processing (*Alalade et al.,* 2019).

CONCLUSION

Value addition through agro-processing improves the quality of agribusiness services and products. Appropriate technologies enhance productivity, improve rural agricultural production systems, and promote peer cooperation at the grassroots village level. Smallholder farmers stand to benefit from agro-processing along the agricultural value chains and at various levels of their production activities. The direct effects range from improved household livelihoods with enhanced incomes and employment opportunities, to better nutrition and food security due to increased productivity and postharvest handling, limiting food loss. Indirect impacts include information sharing crucial for product standardization, market linkages, and gaining better value for their products from off-takers and other actors along their specific productive value chain systems. The coordination of value chain participants leads to strategic alliances that unlock systemic bottlenecks that hinder the attainment of sustainable farming such as silo operations among village farmers. Authorities in SSA should formulate legislation and policies that can organize country and locally specific value chains to create cottage industries in rural areas and link them to regional and international markets. Most studies were based on crops (cassava, potato, cocoa, cashew, and maize) and poultry, with no mention of livestock, which could offer a broader view for advancing diversified value chains examination. Systematic literature review is limited in scope; hence, there is a need for quality peer-reviewed research, based on primary data, for proper policy and economic intervention in SSA. Future research should be conducted on specific agro-products with a holistic value chain analysis.

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