International Journal of
Livestock Policy
(IJLP)

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CARI Journals

International Journal of Livestock Policy
ISSN: 2957-4382 (online)
Vol. 3, Issue No. 2, pp 41 - 54, 2024
www.carijournals.org

Effectiveness of Subsidy Policies on Livestock Feed and Production

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Accepted: 14th April, 2024, Received in Revised Form: 9th May, 2024, Published: 4th, June, 2024

Abstract

Purpose: The general purpose of this study was to evaluate the effectiveness of subsidy policies on livestock feed and production.

Methodology: The study adopted a desktop research methodology. Desk research refers to secondary data or that which can be collected without fieldwork. Desk research is basically involved in collecting data from existing resources hence it is often considered a low cost technique as compared to field research, as the main cost is involved in executive's time, telephone charges and directories. Thus, the study relied on already published studies, reports and statistics. This secondary data was easily accessed through the online journals and library.

Findings: The findings reveal that there exists a contextual and methodological gap relating to the effectiveness of subsidy policies on livestock feed and production. Preliminary empirical review revealed that well-targeted subsidy policies significantly enhanced the efficiency and sustainability of livestock production by stabilizing feed costs, which helped farmers maintain consistent production levels and invest in advanced technologies. These investments led to improved productivity and animal welfare, contributing to long-term agricultural sustainability. The study also highlighted the environmental benefits of subsidies promoting sustainable practices and emphasized the importance of equitable distribution to ensure smallholder and marginalized farmers benefited from these policies. This inclusive approach ensured broader economic and social development within the agricultural sector.

Unique Contribution to Theory, Practice and Policy: The Theory of Planned Behaviour, Resource-Based View and Institutional Theory may be used to anchor future studies on subsidy policies on livestock feed and production. The study concluded with several key recommendations. It emphasized the need for a nuanced understanding of subsidy impacts, suggesting future research should develop models incorporating economic, environmental, and social variables. Practically, it recommended enhancing subsidy programs to be more targeted and equitable, ensuring smallholder and marginalized farmers benefit fairly. The study also highlighted aligning subsidies with sustainability goals and increasing funding for agricultural innovation. International cooperation and policy harmonization were suggested to prevent market distortions and promote fair trade. Additionally, it stressed incorporating stakeholder feedback and continuous monitoring and evaluation to ensure policies remain effective and relevant.

Keywords: *Subsidy Policies, Livestock Feed, Livestock Production, Food Security, Economic Stability, Advanced Technologies, Precision Feeding Systems*

1.0 INTRODUCTION

Livestock feed and production are critical components of the global agricultural economy, influencing the efficiency, sustainability, and profitability of livestock industries worldwide. The availability and quality of livestock feed directly impact animal growth rates, reproductive success, and overall productivity. The global livestock sector faces numerous challenges, including fluctuating feed prices, climate change impacts, and the need for sustainable practices. Understanding these dynamics is essential for ensuring food security and economic stability across different regions. In the United States, livestock feed production is a significant industry supporting a vast livestock sector. The U.S. is a leading producer of corn and soybeans, which are primary ingredients in livestock feed. In 2020, the U.S. produced approximately 15 billion bushels of corn, with a significant portion used for animal feed (USDA, 2021). Advances in feed technology, such as precision feeding, have improved feed efficiency and reduced waste, thereby enhancing livestock productivity. Precision feeding systems adjust the feed mix based on individual animal needs, optimizing growth and health outcomes. This approach has led to improved feed conversion ratios and reduced environmental impacts by minimizing excess nutrient excretion (Kebreab, Strathe, Fadel, Moraes, France & Casper, 2012); USDA, 2020).

The U.S. livestock industry is diverse, including beef, pork, poultry, and dairy production. In 2020, the U.S. produced 27.5 billion pounds of beef, 28.3 billion pounds of pork, and 50.4 billion pounds of poultry (USDA, 2021). The integration of advanced technologies, such as genomic selection and automated milking systems, has further boosted productivity. For example, genomic selection in dairy cattle has led to significant improvements in milk yield and quality, as it allows for the selection of animals with superior genetic traits. Automated milking systems not only increase efficiency but also improve animal welfare by reducing stress and enabling more frequent milking (Van Eenennaam, Weigel, Young, Cleveland & Dekkers, 2014; USDA, 2020).

In the United Kingdom, livestock feed production emphasizes sustainability and reducing environmental impact. The UK produces a variety of feed ingredients, including cereals and oilseeds. In 2019, the UK produced 15 million tonnes of wheat, with a significant portion used for animal feed (DEFRA, 2020). Sustainable feed practices, such as using by-products from other industries, have been promoted to enhance efficiency and reduce waste. For example, distillers' grains from the brewing industry are used as a high-protein feed for cattle, which improves both environmental and economic outcomes. These practices contribute to the circular economy by repurposing waste products and reducing the environmental footprint of feed production (DEFRA, 2020; Wilkinson, 2011).

The UK's livestock sector includes beef, pork, poultry, and dairy production, with a strong emphasis on high welfare standards. In 2019, the UK produced 893,000 tonnes of beef, 990,000 tonnes of pork, and 1.8 million tonnes of poultry meat (DEFRA, 2020). The adoption of welfare-friendly practices has been shown to improve productivity and marketability. For instance, enriched housing for poultry reduces stress and improves growth rates, leading to higher-quality products. These practices are aligned with consumer preferences for ethically produced food, which can command higher prices in the market. Additionally, the UK's Red Tractor Assurance scheme certifies farms that meet rigorous welfare, environmental, and food safety standards, enhancing consumer trust and market access (Ingram, Mills & Dibari, 2018).; DEFRA, 2020).

Japan faces unique challenges in livestock feed production due to limited arable land, necessitating a heavy reliance on imported feed ingredients, primarily corn and soybeans. In 2020, Japan imported 15 million tonnes of corn, with over 75% used for animal feed (MAFF, 2020). To enhance feed efficiency and reduce dependency on imports, Japan has invested in research on alternative feed sources, such as rice bran and fishmeal. These efforts aim to improve the sustainability and resilience of the livestock

sector by diversifying feed sources and reducing the environmental impact of feed production. Additionally, Japan's focus on precision feeding technologies helps optimize feed utilization and improve animal performance (Fujimoto, Kato & Hasegawa, 2019; MAFF, 2020).

Japan's livestock sector is characterized by high-value products, particularly in the beef industry, where Wagyu beef is renowned for its marbling and quality. In 2020, Japan produced 510,000 tonnes of beef and 1.3 million tonnes of pork (MAFF, 2020). Advanced breeding and feeding techniques are critical in maintaining the high standards of Wagyu beef. Precision feeding ensures that cattle receive the optimal diet for producing the desired meat quality, while advanced breeding programs focus on enhancing genetic traits that contribute to marbling and tenderness. These practices help maintain Japan's reputation for high-quality beef, supporting both domestic consumption and exports to premium markets (MAFF, 2020; Fujimoto et al., 2019).

Brazil is a major player in global livestock feed production, with vast resources dedicated to growing feed crops like corn and soybeans. In 2020, Brazil produced 102 million tonnes of soybeans, with a significant portion used for animal feed (FAO, 2021). The use of integrated crop-livestock-forestry systems has improved feed production sustainability, enhancing soil fertility and reducing deforestation. These systems involve rotating crops, livestock, and trees on the same land, which helps maintain ecological balance and improve feed efficiency. This approach not only boosts feed availability but also supports environmental conservation efforts, aligning with global sustainability goals (Filho, Miranda & Maia, 2018; FAO, 2021).

Brazil is one of the world's largest producers of beef and poultry, with significant exports to global markets. In 2020, Brazil produced 10.5 million tonnes of beef and 14.3 million tonnes of poultry meat (FAO, 2021). The country's vast land resources and favorable climate conditions support large-scale livestock production. However, Brazil faces challenges related to environmental sustainability, necessitating practices that balance productivity with conservation. For instance, rotational grazing systems improve pasture management, reduce environmental degradation, and enhance livestock health. These practices help mitigate the environmental impact of livestock production while maintaining high productivity levels (Filho et al., 2018; FAO, 2021).

African countries face diverse challenges in livestock feed production, including climatic variability, limited resources, and infrastructural constraints. In regions like East Africa, reliance on natural pastures and crop residues is common, but these sources can be inconsistent and low in nutritional value. Efforts to improve feed availability include the introduction of drought-resistant forage crops and the use of agricultural by-products. For example, in Kenya, initiatives to promote the cultivation of fodder crops like Napier grass have shown positive results in improving feed supply and livestock productivity. These efforts are crucial for enhancing the resilience of livestock systems to climate variability and improving overall productivity (Cramer, Thornton & Loboguerrero, 2017; Kimaru-Muchai, Mugwe, Mucheru-Muna& Mugendi, 2020).

Livestock production is a crucial part of the agricultural economy in many African countries, contributing to food security, livelihoods, and economic development. In Ethiopia, livestock accounts for nearly 20% of the GDP, with cattle, sheep, and goats being the primary species. Challenges such as disease outbreaks, limited access to veterinary services, and inadequate infrastructure hinder productivity. However, interventions like improved breeding programs, vaccination campaigns, and better feed management practices have shown potential in enhancing livestock production. For example, the introduction of improved cattle breeds has led to higher milk yields and better growth rates in various regions. These efforts are essential for boosting the productivity and sustainability of livestock systems in Africa (Cramer et al., 2017; Ethiopian Ministry of Agriculture, 2020).

Subsidy policies are government interventions designed to support specific economic sectors by providing financial assistance to reduce costs and encourage production. These policies can take various forms, including direct financial support, tax breaks, price supports, and grants. The primary goal of subsidies is to promote stability, enhance competitiveness, and ensure the sustainability of vital industries. In agriculture, subsidies are crucial for supporting farmers by reducing the cost of inputs, stabilizing market prices, and ensuring food security. This is particularly important in volatile markets where price fluctuations can significantly impact farmers' livelihoods (Glauber, 2013; Baffes & de Gorter, 2005). For instance, the U.S. farm bill includes various subsidy programs to support farmers during economic downturns and adverse climatic conditions (Gardner, 2002).

Agricultural subsidies have a long history, particularly in developed countries where they have been used to stabilize farm incomes and ensure food security. In the United States, the Agricultural Adjustment Act of 1933 was one of the earliest forms of subsidy policy aimed at reducing crop surpluses and increasing prices (Gardner, 2002). This policy marked the beginning of a series of federal programs designed to support farmers through direct payments and price supports. Similarly, the European Union's Common Agricultural Policy (CAP), established in 1962, has provided substantial subsidies to farmers to promote agricultural productivity and rural development. CAP reforms have continually adjusted subsidy allocations to balance productivity with environmental sustainability and rural development goals (Matthews, 2013).

Agricultural subsidies can be classified into several categories, including input subsidies, output subsidies, income support, and risk management subsidies. Input subsidies help reduce the cost of essential inputs such as seeds, fertilizers, and livestock feed, making it more affordable for farmers to maintain their production levels. Output subsidies provide price supports to ensure farmers receive a minimum price for their produce, protecting them from market price volatility. Income support subsidies offer direct payments to farmers to supplement their income, ensuring financial stability. Risk management subsidies help farmers mitigate the impact of adverse events such as droughts, floods, and market fluctuations by providing insurance and financial aid (OECD, 2011). These subsidies are designed to address the specific needs of farmers and the agricultural sector, ensuring resilience and sustainability.

Subsidies for livestock feed are crucial for enhancing livestock production efficiency. By reducing the cost of feed, subsidies enable farmers to allocate more resources to other aspects of production, such as animal health and housing. This can lead to improved growth rates, better reproductive performance, and higher overall productivity. For instance, feed subsidies in the United States have helped maintain stable feed prices, supporting the large-scale production of beef, pork, and poultry. The availability of affordable, high-quality feed is essential for maintaining high productivity levels in these industries (USDA, 2020). Moreover, feed subsidies can help mitigate the impact of feed price volatility, ensuring that livestock producers have a reliable supply of feed regardless of market conditions (Mathews & Johnson, 2013).

In countries with substantial agricultural subsidies, such as the United States and the European Union, livestock production tends to be more intensive and productive. Subsidies allow farmers to invest in advanced technologies and best practices that enhance efficiency and output. For example, U.S. dairy farms benefit from feed subsidies, which help them maintain high milk production levels and competitive market prices. These subsidies support the adoption of technologies such as automated milking systems and precision feeding, which further boost productivity and efficiency (Van Eenennaam et al., 2014). Similarly, EU subsidies under the CAP support sustainable livestock farming practices that improve productivity and environmental outcomes. These practices include rotational grazing, organic farming, and the use of renewable energy sources on farms (European Commission, 2019).

While subsidies can enhance productivity, they also have implications for environmental sustainability. Input subsidies, particularly for fertilizers and feed, can lead to overuse and environmental degradation if not managed properly. Sustainable subsidy policies should encourage practices that balance productivity with environmental conservation. For instance, subsidies can be designed to promote the use of environmentally friendly feed sources and sustainable farming practices. This includes supporting the adoption of precision agriculture technologies that optimize input use and reduce waste (Tilman, Cassman, Matson, Naylor & Polasky, 2002; OECD, 2011). Furthermore, subsidies can incentivize practices such as cover cropping and no-till farming, which improve soil health and reduce erosion, contributing to long-term agricultural sustainability.

Subsidies have significant economic impacts on both domestic and international markets. Domestically, subsidies can stabilize farm incomes and ensure the viability of agricultural sectors. By reducing production costs and providing financial stability, subsidies help farmers remain competitive and sustain their livelihoods. Internationally, subsidies can influence trade dynamics by affecting comparative advantages and market prices. Subsidized livestock products from developed countries can outcompete those from developing countries, potentially affecting global trade patterns and the livelihoods of farmers in less-subsidized regions. This can lead to trade disputes and calls for the reduction of agricultural subsidies in international trade agreements (Baffes & de Gorter, 2005; Glauber, 2013).

Effective subsidy policies require careful design and implementation to achieve desired outcomes without unintended consequences. Policymakers must consider the specific needs of the agricultural sector, environmental sustainability, and economic impacts. Transparent criteria for subsidy allocation, regular monitoring, and evaluation, and adjustments based on feedback and changing conditions are essential for the success of subsidy programs. For example, the U.S. Farm Bill undergoes periodic reviews and adjustments to ensure that subsidy programs address current agricultural challenges and opportunities (Gardner, 2002). Similarly, the CAP undergoes regular reforms to balance agricultural productivity with rural development and environmental sustainability goals (Matthews, 2013).

Despite their benefits, subsidy policies face several challenges and criticisms. One major issue is the potential for market distortion, where subsidies lead to overproduction and waste. This can result in lower prices and increased pressure on global markets. Additionally, subsidies can disproportionately benefit larger, more established farmers, exacerbating inequalities within the agricultural sector. There is also the risk of dependency, where farmers rely heavily on subsidies rather than improving efficiency and competitiveness. Addressing these challenges requires careful policy design that promotes inclusivity and encourages innovation and sustainability (Glauber, 2013; Gardner, 2002).

Future subsidy policies should focus on sustainability, inclusivity, and resilience. Policymakers should design subsidies that promote sustainable practices, support smallholder and marginalized farmers, and build resilience against climate change and market volatility. Integrating technological advancements, such as precision agriculture and digital monitoring, can enhance the effectiveness and efficiency of subsidy programs. Additionally, international cooperation and alignment of subsidy policies can help address global challenges and promote fair trade practices. By prioritizing these goals, subsidy policies can contribute to a more sustainable and equitable agricultural sector (Tilman et al., 2002; OECD, 2011).

1.1 Statement of the Problem

This study addresses the critical role that government subsidies play in stabilizing and enhancing the livestock sector. Despite significant investments in agricultural subsidies globally, there is a lack of comprehensive understanding of how these policies impact the efficiency and productivity of livestock feed and production. For example, in 2020, the U.S. government allocated $32 billion in direct

payments to farmers as part of its subsidy programs (USDA, 2020). However, the specific outcomes of these subsidies on livestock feed efficiency and overall production remain under-researched. This study aims to fill this gap by evaluating the effectiveness of various subsidy policies, determining their direct and indirect impacts on livestock production, and identifying best practices for policy design and implementation. Several research gaps persist in the current literature, which this study intends to address. First, while there are numerous studies on the general impact of agricultural subsidies, specific research focusing on their effects on livestock feed quality, availability, and production efficiency is limited (Glauber, 2013; Baffes & de Gorter, 2005). Second, there is a need for longitudinal studies that assess the long-term effects of subsidy policies, considering variables such as market fluctuations, climate change, and evolving agricultural technologies (Matthews, 2013). Third, there is insufficient comparative analysis between regions with different subsidy models, such as the United States and the European Union, to understand how different policy frameworks affect livestock productivity (OECD, 2011). By addressing these gaps, the study will provide a more nuanced understanding of subsidy effectiveness and contribute to the optimization of policy frameworks. The findings of this study will benefit a wide range of stakeholders, including policymakers, livestock producers, and agricultural economists. Policymakers will gain valuable insights into the effectiveness of current subsidy models, enabling them to design more efficient and targeted subsidy programs that enhance livestock production and sustainability (Glauber, 2013). Livestock producers will benefit from a clearer understanding of how subsidies can optimize their feed usage and production practices, potentially leading to increased profitability and sustainability (Tilman et al., 2002). Agricultural economists will be able to use the study's findings to develop models that predict the economic impacts of subsidy policies under various scenarios, aiding in future policy development and economic forecasting (Gardner, 2002). Overall, the study aims to create a comprehensive framework that links subsidy policies to tangible outcomes in livestock feed and production, promoting both economic and environmental sustainability in the agricultural sector.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB), developed by Icek Ajzen in the late 1980s, provides a robust framework for understanding how human intentions and behaviors are influenced by attitudes, subjective norms, and perceived behavioral control. The main theme of TPB is that an individual's intention to perform a behavior (such as adopting or supporting subsidy policies) is determined by their attitude towards the behavior, the social pressures they perceive (subjective norms), and their perceived control over performing the behavior (Ajzen, 1991). This theory is relevant to the study of the effectiveness of subsidy policies on livestock feed and production because it helps explain the decision-making processes of various stakeholders, including policymakers, farmers, and consumers. For example, farmers' willingness to adopt subsidized feed practices may depend on their beliefs about the benefits (e.g., cost savings, increased productivity), the influence of peers and agricultural advisors, and their confidence in successfully implementing these practices (Ajzen, 1991; Fishbein & Ajzen, 2010).

2.1.2 Resource-Based View (RBV)

The Resource-Based View (RBV) of the firm, proposed by Jay Barney in 1991, posits that a firm's sustainable competitive advantage is derived from its unique resources and capabilities that are valuable, rare, inimitable, and non-substitutable (VRIN). The main theme of RBV is that internal resources, rather than external market conditions, are the primary determinants of a firm's strategy and performance. In the context of livestock feed and production, subsidies can be seen as strategic

resources that enhance the competitive advantage of farmers by lowering costs and enabling investment in advanced technologies and practices. This theory is particularly relevant because it highlights how subsidy policies can enhance the resource base of livestock producers, thereby improving productivity and sustainability. By providing financial support, subsidies allow farmers to invest in better feed, animal health, and infrastructure, which are critical for maintaining high levels of production and competitiveness (Barney, 1991; Wernerfelt, 1984).

2.1.3 Institutional Theory

Institutional Theory, originally developed by scholars such as John Meyer and Brian Rowan in the late 1970s, focuses on the role of institutions in shaping organizational behavior. The main theme of Institutional Theory is that organizations conform to the rules and norms of the institutional environment to gain legitimacy, resources, and stability. This theory is relevant to the study of subsidy policies because it helps explain how government regulations, industry standards, and social expectations influence the adoption and effectiveness of these policies. For instance, livestock producers may adopt subsidized feed practices not only for economic benefits but also to comply with regulatory requirements and align with industry standards. Institutional pressures, such as those from government agencies, agricultural organizations, and consumer groups, play a significant role in shaping the behavior of farmers and other stakeholders in the livestock industry (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). Understanding these institutional dynamics is crucial for designing effective subsidy policies that are widely accepted and implemented.

2.2 Empirical Review

Glauber (2013) aimed to evaluate the impact of agricultural policy reforms, including subsidy policies, on livestock production in the United States. Using a historical analysis, the study examined agricultural subsidies from the 1980s to the early 2010s. Data were collected from government reports, agricultural census data, and market prices. The study found that subsidy policies significantly influenced livestock production by stabilizing feed costs and encouraging the adoption of advanced farming practices. The subsidies helped mitigate the effects of price volatility and provided a safety net for farmers during economic downturns. Glauber recommended continued support for targeted subsidies that promote sustainable farming practices and investment in agricultural technology. The study also suggested periodic reviews of subsidy effectiveness to ensure alignment with current economic and environmental goals.

Baffes & de Gorter (2015) examined the effect of decoupled subsidies on livestock feed production and overall agricultural sustainability in developing countries. A comparative analysis was conducted using data from several developing countries that implemented subsidy reforms. The researchers used econometric models to analyze the relationship between subsidies and feed production. The study revealed that decoupled subsidies improved feed production efficiency and encouraged diversification in feed sources. However, it also highlighted issues with implementation, such as the need for better-targeted subsidies to prevent misuse and ensure benefits reach smallholder farmers. The researchers recommended improving subsidy targeting mechanisms and increasing transparency in subsidy allocation. They also suggested integrating subsidies with broader rural development programs to maximize their impact.

Matthews (2013) assessed the effectiveness of the European Union's Common Agricultural Policy (CAP) subsidies on livestock production and environmental sustainability. The study used a mix of qualitative and quantitative methods, including policy analysis, interviews with stakeholders, and statistical analysis of agricultural output and environmental indicators. Matthews found that CAP subsidies significantly supported livestock production by reducing feed costs and stabilizing income for farmers. However, the study also noted that the environmental benefits were mixed, with some

regions showing improvements and others experiencing increased pressures on natural resources. The study recommended enhancing CAP subsidies to better address environmental sustainability, including stricter environmental conditions for subsidy eligibility and increased support for organic farming practices.

Gao, Huang & Cao (2014) evaluated the impact of feed subsidies on livestock production efficiency and sustainability in China. The researchers conducted a field survey of livestock farmers in several Chinese provinces, combined with econometric analysis of production data and subsidy records. The study found that feed subsidies significantly improved production efficiency and animal health outcomes. However, there were challenges in subsidy distribution, with smaller farms often receiving less support compared to larger operations. The researchers suggested improving subsidy distribution mechanisms to ensure equitable access for all farmers, particularly smallholders. They also recommended increasing investment in agricultural extension services to support the effective use of subsidies.

Sumner, Matthews & Mench (2017) assessed the economic and environmental impacts of livestock feed subsidies in the United States. The study utilized a simulation model to predict the long-term impacts of different subsidy scenarios on livestock production, feed prices, and environmental indicators. The results indicated that feed subsidies contributed to higher production levels and lower feed costs, but also led to increased environmental pressures such as higher greenhouse gas emissions and water usage. The study recommended adjusting subsidy structures to incorporate environmental sustainability goals, such as incentivizing practices that reduce emissions and conserve water.

Kimaru-Muchai, Mugwe, Mucheru-Muna & Mugendi (2020) investigated the impact of climate-smart agricultural practices, including subsidy policies, on livestock feed and production in Kenya. The study employed a mixed-methods approach, combining surveys of livestock farmers with statistical analysis of production data and climate indicators. The findings showed that subsidies for climate-smart practices significantly improved feed availability and livestock productivity, particularly in regions prone to drought. The study also highlighted the need for better awareness and training on subsidy programs among farmers. The authors recommended increasing funding for climate-smart subsidies and enhancing farmer education programs to improve the uptake and effective use of these subsidies.

Filho, Miranda & Maia (2018) examined the effectiveness of integrated crop-livestock-forestry systems supported by subsidy policies in Brazil. The study used case studies of farms implementing integrated systems, along with econometric analysis of production and environmental data. The study found that subsidies for integrated systems significantly enhanced feed production sustainability and livestock productivity. These systems also provided environmental benefits, such as improved soil health and reduced deforestation. The authors recommended expanding subsidies for integrated systems and increasing support for research and development to optimize these practices.

3.0 METHODOLOGY

The study adopted a desktop research methodology. Desk research refers to secondary data or that which can be collected without fieldwork. Desk research is basically involved in collecting data from existing resources hence it is often considered a low cost technique as compared to field research, as the main cost is involved in executive's time, telephone charges and directories. Thus, the study relied on already published studies, reports and statistics. This secondary data was easily accessed through the online journals and library.

4.0 FINDINGS

This study presented both a contextual and methodological gap. A contextual gap occurs when desired research findings provide a different perspective on the topic of discussion. For instance, Kimaru-

Muchai, Mugwe, Mucheru-Muna & Mugendi (2020) investigated the impact of climate-smart agricultural practices, including subsidy policies, on livestock feed and production in Kenya. The study employed a mixed-methods approach, combining surveys of livestock farmers with statistical analysis of production data and climate indicators. The findings showed that subsidies for climate-smart practices significantly improved feed availability and livestock productivity, particularly in regions prone to drought. The study also highlighted the need for better awareness and training on subsidy programs among farmers. The authors recommended increasing funding for climate-smart subsidies and enhancing farmer education programs to improve the uptake and effective use of these subsidies. On the other hand, the current study focused on evaluating the effectiveness of subsidy policies on livestock feed and production.

Secondly, a methodological gap also presents itself, for example, in their study on investigating the impact of climate-smart agricultural practices, including subsidy policies, on livestock feed and production in Kenya; Kimaru-Muchai, Mugwe, Mucheru-Muna & Mugendi (2020) employed a mixed-methods approach, combining surveys of livestock farmers with statistical analysis of production data and climate indicators. Whereas, the current study adopted a desktop research method.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that targeted and well-implemented subsidy policies significantly enhance the efficiency and sustainability of livestock production. Subsidies help stabilize feed costs, allowing farmers to maintain consistent production levels even during periods of economic instability and adverse climatic conditions. This financial stability is crucial for ensuring food security and economic resilience, particularly in regions where livestock farming is a major economic activity. By reducing the financial burden associated with purchasing high-quality feed, subsidies enable farmers to adopt better feeding practices, leading to improved animal health and productivity.

Furthermore, the study found that subsidies play a pivotal role in encouraging long-term investments in agricultural technology and infrastructure. Farmers who receive feed subsidies are more likely to invest in advanced technologies such as precision feeding systems and automated milking machines, which further enhance productivity and animal welfare. These technological advancements contribute to sustainable farming practices by optimizing resource use and minimizing waste. The adoption of such technologies not only improves immediate production outcomes but also positions farmers to be more resilient against future economic and environmental challenges.

In addition to economic benefits, the study highlighted the environmental advantages of well-structured subsidy policies. Subsidies that promote the use of sustainable feed sources and environmentally friendly farming practices can significantly reduce the ecological footprint of livestock production. For example, subsidies that encourage the adoption of integrated crop-livestock systems or the use of by-products from other agricultural processes can lead to more efficient land use and lower greenhouse gas emissions. By aligning subsidy policies with environmental sustainability goals, policymakers can support the dual objectives of boosting livestock productivity and protecting natural resources.

The study underscored the importance of equitable subsidy distribution to ensure that the benefits reach smallholder and marginalized farmers. Effective subsidy policies should include mechanisms to ensure that all farmers, regardless of their scale of operation, can access the support they need to improve their production practices. This includes transparent criteria for subsidy allocation, regular monitoring, and adjustments based on feedback from the farming community. By prioritizing inclusivity and equity

in subsidy distribution, policymakers can ensure that the positive impacts of these policies are felt across the agricultural sector, contributing to broader economic and social development goals.

5.2 Recommendations

The study provided several key recommendations that contribute significantly to theory, practice, and policy. Firstly, from a theoretical perspective, the study suggested the need for a more nuanced understanding of how subsidy policies interact with market dynamics and farmer behavior. Future research should focus on developing models that incorporate various economic, environmental, and social variables to predict the long-term impacts of subsidy policies. These models can help policymakers design more effective subsidies that not only stabilize markets but also promote sustainable agricultural practices. Integrating behavioral economics into these models can provide deeper insights into how farmers make decisions in response to subsidies, which can lead to more tailored and effective policy interventions.

Practically, the study recommended enhancing the design and implementation of subsidy programs to ensure they are effectively targeted and equitable. It emphasized the importance of including smallholder and marginalized farmers in subsidy schemes, ensuring that the benefits of subsidies are distributed fairly across the agricultural sector. To achieve this, the study suggested implementing transparent criteria for subsidy allocation and establishing robust monitoring and evaluation frameworks. These measures can help identify and address any disparities in subsidy distribution, ensuring that all farmers have the opportunity to benefit from government support. Additionally, providing training and resources to help farmers effectively utilize subsidies can maximize the impact of these programs on productivity and sustainability.

In terms of policy, the study highlighted the importance of aligning subsidy policies with broader sustainability goals. This involves designing subsidies that encourage environmentally friendly farming practices, such as the use of sustainable feed sources and integrated crop-livestock systems. Policymakers should consider conditional subsidies that require farmers to adopt specific sustainable practices in exchange for financial support. This approach not only promotes environmental sustainability but also ensures that public funds are used effectively to achieve multiple policy objectives. Furthermore, the study recommended increasing funding for research and development in agricultural technologies that enhance feed efficiency and reduce environmental impact. Investing in innovation can drive long-term improvements in livestock production and sustainability.

The study also underscored the need for international cooperation and policy harmonization. Given the global nature of agricultural markets, aligning subsidy policies across countries can help prevent market distortions and promote fair trade practices. Policymakers should engage in international dialogues to share best practices and develop coordinated approaches to subsidy design and implementation. This can lead to more consistent and effective subsidy policies worldwide, benefiting both producers and consumers. Additionally, international cooperation can support the development of global standards for sustainable agriculture, further promoting environmental and economic sustainability.

Another critical recommendation from the study was the importance of incorporating stakeholder feedback into the policy-making process. Engaging farmers, agricultural organizations, and other stakeholders in the design and evaluation of subsidy programs can ensure that these policies are responsive to the needs and challenges of the agricultural sector. Regular consultations and feedback mechanisms can help identify any issues or areas for improvement, allowing for timely adjustments to subsidy policies. This participatory approach can enhance the effectiveness and acceptance of subsidies, leading to better outcomes for both farmers and the broader economy.

Finally, the study highlighted the need for continuous monitoring and evaluation of subsidy policies. Policymakers should establish systems to track the impact of subsidies on livestock feed and production, using both quantitative and qualitative data. This ongoing assessment can provide valuable insights into the effectiveness of different subsidy approaches and inform future policy adjustments. By continuously evaluating and refining subsidy policies, governments can ensure that they remain effective and relevant in the face of changing economic and environmental conditions. This iterative approach to policy-making can lead to more resilient and sustainable agricultural systems.

These comprehensive recommendations underscore the importance of well-designed and implemented subsidy policies in promoting efficient, sustainable, and equitable livestock production. By addressing the theoretical, practical, and policy dimensions of subsidy effectiveness, these recommendations provide a roadmap for enhancing the impact of subsidies on the agricultural sector.

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