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Full Length Research Paper

Africa's Pig Industry: Present Situation, Obstacles, Potential, and Prospects

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One of the profitable businesses in the livestock subsector of agriculture is the production of pigs. It makes a substantial contribution to the economy and the supply of animal protein, which improves food security in Africa and around the world. The current state of pig production in Africa was examined in this article, along with its opportunities, difficulties, and possibilities. Africa's pig population makes up 4.6% of all pigs worldwide. They are found all over Africa, with the exception of Northern Africa, where pig farming is discouraged for religious and cultural reasons. Smallholder farmers raise them mostly in rural areas of Africa, which explains why indigenous breeds and their hybrids make up the majority of the pig population in most of the continent. Pigs have cultural and social value and are essential to rural communities' ability to maintain their standard of living. Africa's pig production system is primarily traditional, but it is expanding quickly and changing to become more modern. Africa now produces more than 2 million tons of pork annually, up from less than a million tons in 2000. One of the primary factors limiting pig productivity in Africa is the prevalence of illness outbreaks, particularly African swine fever. Other factors include a lack of technical expertise and skills, high temperatures, restricted access to superior breeds, high feed and veterinary input costs, unwelcoming government regulations, prejudice based on religion and culture, inadequate processing facilities, and an underdeveloped value chain. The need for more food production is indicated by the estimated 2.5 billion people living in Africa by 2050, rising urbanization, and a decline in the number of farmers. For increased productivity and easier exporting, the pig production systems in Africa need developmental research, advances in housing, feed production and manufacture, animal health, processing, capacity building, and pig-friendly regulations.

Key words: Farmers; Policy; Pork; Smallholder; Transformation; Value-chain.

INTRODUCTION

Global cattle production has benefited from Africa's enormous territory and growing population. With 1.4 billion people living there, Africa is the second largest continent in the world and accounts for 17.9% of the global population [1]. The world's livestock sector is significantly shaped by Africa's remarkable biological and geographical diversity as well as its sociocultural complexity. A third of the world's livestock production [2] and almost 40% of Africa's agricultural GDP [3] come from the continent's livestock population. In Sub-Saharan Africa (SSA), livestock will play a bigger role in the future as the region's population, affluence, and urbanization all increase demand for food derived from animals. By 2050, consumers with low and intermediate incomes are expected to require 5.5 million tonnes more milk and 107 million tonnes more meat than they did in 2005 and 2007 [4]. By 2050, SSA's per capita annual meat and milk consumption is projected to be 14 kg and 30 L, respectively [2].

One way that Africa might satisfy its demand for animal protein and fulfill international demands through exports is by raising pigs. 1.67% of the world's pigmeat is produced in Africa. In Africa, pig production is a significant part of the livestock subsector of agriculture. It is impossible to overstate how important pig production is to the continent's ability to sustain livelihoods by providing a healthy source of protein, jobs, and revenue. Pork is readily digested, has a high biological value, and contains vital amino acids. Pork is referred to as "pink meat" because it shares the nutritional

characteristics of both red and white meats [5]. Pig meat is a significant source of animal protein in human diets, according to the global trend in meat production and consumption from 2016 to 2020. According to estimates based on FAO data [5,6], pig is the most consumed meat worldwide, making up 36% of global meat consumption, more than beef (24%), poultry (33%), and goats and sheep (5%). Pig meat, however, is not the most popular meat in Africa; instead, it comes in second after beef, mutton, fowl, and chevon.
In the majority of Africa, pigs are raised primarily under vast production systems, where they are neglected and left to fend for themselves [7]. However, the conventional extensive system is quickly giving way to semi-intensive and intensive manufacturing systems. Pigs have the potential to significantly improve food and nutrition security in Africa and around the world due to their inherent qualities, which include high fecundity, short generational intervals, superior feed conversion indices, and early maturity when compared to other livestock species. Given its comparatively low production costs when compared to other significant livestock farming enterprises, investing in pig production has turned out to be one of the most lucrative livestock ventures [8]. Pig farming is therefore a thriving industry that has the potential to close the gap in the supply of animal protein, offer reasonably priced meat, and support the economies of Africa and the global community by creating jobs and revenue. Despite Africa's potential for pig production, the industry is hindered by a number of issues that keep it from reaching its full potential. With regard to the production system, population distribution, pork output, per capita consumption, problems, and future prospects, this research sought to analyze the current state of pig production in Africa.

PRESENT PIG PRODUCTION STATUS IN AFRICA

Pig production systems in Africa

The More than 70% of pigs in Africa live in rural areas, where they are typically left to scrounge for food [9]. Pigs are widespread throughout the continent. Furthermore, 90% of Nigeria's pig population is raised in vast systems, and the country contributes 65% of West Africa's total pork production [10]. In many African countries, raising pigs is a source of income, particularly for young people and women engaged in small-scale farming. Pig production systems in Africa vary and are intricate among nations, each with unique potential and difficulties. The prevalence of disease outbreaks, particularly Africa swine fever (ASF), and rising input costs have had an impact on the pig business globally, affecting both production costs and output. Africa has been impacted by these because of the widely used production systems.

In Africa, pig farming methods typically vary from smallholder, traditional scavenging systems to more intensive commercial setups [11,12]. The pigs are exposed to the risks of weather extremes, disease infection, and theft because the traditional arrangement permits them to move around and search for food. The majority of the animals raised in this method are native breeds. Although they do not readily achieve market weight, this approach also uses crosses between native and exotic breeds. This is because scavenging operations take energy that should be used for growth and development, while traditional systems could not give enough nutrition for healthy growth [8]. Animals that scavenge are typically linked to high rates of disease infection.

The exotic breeds and their crosses are the primary foundation of the intense system. However, in order to meet the nutritional needs of the animals for optimal productivity in confinement, they must employ formulated diets, which can be costly because to the high cost of imported feed ingredients and the paucity of grains. More capital is needed for an intensive system of production since it also requires the supply of decent housing, health care, and facilities for disposing of waste for appropriate management. Many African pig farmers, particularly smallholder farmers, use locally sourced materials like cane, bamboo, planks, or mud for walls or house demarcation, even if others are investing in the use of sophisticated pig farm equipment. Although they are not exclusive, the common breeds of pigs raised under the traditional method include the indigenous breeds and their hybrids. Despite the fact that Large White, Landrace, and their crosses are more popular, exotic breeds like Large White, Landrace, Duroc, Hampshire, and Pietrain are common in the intense method of production [8]. Disease propagation is facilitated by traditional systems' open scavenging and scant biosecurity precautions [11]. If properly maintained, intensive systems can use biosecurity techniques to reduce the risk of disease. However, small-scale pig producers in Africa might find it difficult to afford the cost of putting biosecurity measures in place [11].

Pig farm estates and clusters have recently been established for smallholder farmers in Africa. They are sometimes arranged into cooperatives or farmer organizations. This is to make some facilities that large-scale farmers likewise enjoy easily accessible to smallholder farmers. Farmers who belong to a cluster or cooperative can easily access resources including loans, government assistance, veterinary care, veterinary services, wholesale input procurement for member sharing, good infrastructure, and market accessibility. The Oke Aro Pig Farm Cluster, the biggest pig farm estate in West Africa, is located in Lagos State, Nigeria, and serves as a prime example [13]. This system's inability to consistently deploy and enforce sound biosecurity measures is one of its main problems. By exchanging labor and equipment among various units in the cluster, farmers and farm attendants violate biosecurity protocols, making it easier for diseases to spread and recur. Technological developments, growing awareness of sustainable practices, shifting consumer preferences and perceptions, and initiatives to address issues like food security and disease management have all had an impact on pig production in Africa

over the years [12]. Pig breeds with enhanced disease resistance, growth rates, and reproductive performance that are well-suited to regional conditions have been developed. The utilization of better breeds and the implementation of intensive or modern production systems may be the reasons why South Africa and Nigeria appear to have the highest pork yield per animal in Africa [1].

Pig population distribution in Africa

As of 2020, there were 44 million pigs in Africa, which accounts for about 4.6% of all pigs worldwide [1]. With 38% of Africa's total pig population, Eastern Africa has the largest percentage of pigs among the continent's five regions (Figure 2). Because of the region's cultural-religious demography, which discourages the consumption of pork, Northern Africa has the smallest pig population in Africa, accounting for less than 1% of the continent's total pig population. This has an impact on both the region's per capita consumption and production of pork. With corresponding contributions of roughly 33%, 17%, and 12% of the continental pig population, other regions such as Western, Central, and Southern Africa are significant producers of pigs [1].

The two African nations with the largest pig populations are Nigeria and Malawi (Figure 1), with an actual population of over 7 million heads (Table 1). Together, the two nations account for about 35% of Africa's entire pig population. Malawi has the highest pig population density in Africa, yet Nigeria has the largest pig population. Figure 3 shows that the number of pigs in Africa has been growing over time, particularly since 1980. Increased living standards and population expansion are to blame for this growth, as they are driving up the need for food. The pig population in Northern and Southern Africa is an exception, despite the fact that the pig population in Eastern, Western, and Middle (Central) Africa has grown more rapidly. In these two areas, the number of pigs has not grown significantly over time.

The number of pigs in Africa grew from 21 million to 43 million between 2001 and 2021, a 101% rise throughout the continent.

Pig meat yield in Africa

In 2021, more than 2 million tons of pork were produced in Africa [1]. Figure 4 shows the amount of pork produced (in tons) in various African regions from 1961 to 2021. Figure 5 shows that, with the exception of Northern Africa, where pork production has decreased by 56%, pork production has increased over time in all of Africa's regions. In Western, Southern, Central, and Eastern Africa, the corresponding increases in pork production rates were 1,696%, 448%, 596%, and 1,396%.

Western Africa produced 768,766.80 tons of pork in total in 2021. South Africa is a large producer of pork in Southern Africa and had the highest per capita consumption of pork in Africa (4.19 kg). Its contribution to Southern Africa's pork output as of 2021 was over 320,450 tonnes, or 97% of the 329,710 tonnes of pork produced in the region (Table 1). Other nations in the region, primarily Namibia, Eswatini (Swaziland), Lesotho, and Botswana, provided the remaining 3%. Over the years, Northern Africa's pork output has followed an uneven pattern with little to no growth. Reduced pig populations, which resulted from what can be called malicious culling of pigs, which claimed that pigs are reservoirs of avian influenza viruses after the disease outbreak in poultry in the region, are the cause of the dramatic decline in pork output in this region starting in 2008 [1]. From 3,893 tonnes in 2006 to 1,328 tonnes in 2011, and then to 1,234 tons in 2015, the production of pork fell [1]. Nonetheless, the region's output figure increased once more to 1,610 tons in 2021, and it is anticipated to keep improving as some local farmers express interest in growing pork for the region's residents and visitors. The Coptic Christian minority, who make up only 10% of the population, are the main producers of pigs in Egypt. Nonetheless, nations like Libya, Sudan, and Western Sahara make up a very little portion of the region's pork production.

The majority of pig farmers in Morocco are poultry farmers who switched to raising pigs when avian flu outbreaks impacted their poultry farms. Producing pork for visitors and certain foreign residents is often their goal. They also hope to close the gap on the importation of pork into the nation, which comes primarily from Spain, Belgium, and France. Due to the significant expansion of the pig industry from 2008 to 2013, which was brought about by the arrival of new local farmers, Morocco has also been known to export pigs to nations like the Gambia and Cyprus, where they are consumed by tourists and foreign residents. Since then, however, Morocco's pig population has not increased significantly; as of 2021, there were about 8,000 pigs and 630 tons of pig meat produced year [6].

Per capita pork consumption in Africa

Because of cultural, religious, economic, and geographic variables, pork intake differs greatly among African nations. In Africa, pork is not the most popular meat. Africa's per capita intake of pork (1.53 kg) is ranked below that of beef (5.22 kg), poultry (6.30 kg), and chevon and mutton (2.39 kg). Africa consumes 1.55 kg of pork per person, which is less than the 14.35 kg consumed in Asia and the 33.79 kg consumed in Europe. Due to shifting tastes and inclinations, meat consumption rises as wealth or income rises. Like in certain other regions of the world, religious and cultural beliefs that forbid eating pork have a significant influence on how much pig is consumed in Africa. The Middle, Western, Eastern, and Northern regions of Africa consume 2.18, 1.97, 1.38, and 0.01 kg of pork per capita, respectively, whereas Southern Africa consumes the most (3.99 kg) [1]. Pork is widely consumed in South Africa, because the population is diversified and has a wide range of dietary preferences. Pork consumption, however, is typically substantially lower in nations with sizable Muslim or Jewish populations. In many African countries, the patterns of pig eating are significantly influenced by these religious differences. Because of Islamic dietary prohibitions, countries with a majority of Muslims, such Egypt, Tunisia, and Algeria, usually have low per capita pork production and consumption [14]. By 2020, Egypt had produced roughly 628 tons,

which is less than the more than 302,000 and 311,000 tonnes of pork produced in South Africa and Nigeria, respectively [1]. Economically growing urban areas are known to see a shift in dietary diversity, with alternative protein sources being seen. The consumption of pork may be significantly impacted by this change. It has been recorded that multinational fast-food chains, especially those that serve pork-based products, have proliferated throughout most African urban centers [15].

Marketing

Although live animal sales are the main marketing channel for pigs sold by producers, pig marketing methods in Africa are found to be straightforward [13]. Pig handling, transportation, and sale conditions are fraught with difficulties [16]. The majority of farmers are compelled to sell live animals to intermediaries, who then sell to butchers. To make as much money as possible, producers occasionally butcher their own animals and sell the fresh pork to the end user. This typically happens when middlemen attempt to drive down prices in order to exploit farmers who are under pressure to sell in order to increase profits. However, there are also out-growery systems, in which farmers produce for specific consumers or processors who then use the animals to make products. The market's ability to operate efficiently is hampered by a number of factors, including inadequate market knowledge, a shortage of capital, difficulty accessing official credit sources, poor roads, and excessive transportation costs. The real market and transaction costs are raised by these limitations. State support for pig products is not available.

In most of Africa, marketing is experienced similarly to how it is in rest of the world. Thus, policy and infrastructure support from the government would improve pig marketing.

CHALLENGES OF PIG PRODUCTION IN AFRICA

Common challenges

Pig farming in Africa faces a variety of difficulties that differ from one nation to the next and even within regions. The following are some typical difficulties that pig farmers in Africa face:

i. Policies and programs that are inconsistent both inside and across nations on the continent: South Africa exports pork and is a significant participant in the continent's pork sector. Shipment delays, product rejection, and harm to trade relationships may result from uneven or sudden changes to export restrictions, especially sanitary and phytosanitary standards. Countries like Kenya have seen changes in import laws pertaining to pork products during the past ten years. The stability of the local market is impacted by the implications of inconsistent import policies, which typically alternate between stringent prohibitions and lenient regulations. These shifts are difficult for importers and traders to handle, which causes supply interruptions and price volatility. Another significant issue affecting pig production in various African nations is the inconsistent application of disease management measures. For instance, pig agriculture in Africa and around the world has faced serious challenges due to ASF outbreaks (Figure 6). Between 2018 and 2019, ASF attacks caused the loss of about 25% of the world's pig population. Both domestic and wild pigs are susceptible to this extremely widespread virus illness. A reduction in pig populations and an effect on farmers' livelihoods can result from the disease's high mortality rates, which can cause large financial losses and hinder pig output in impacted areas [13]. The recurrence of this disease has caused many farmers to quit their jobs because they receive little to no compensation. Due to this, the majority of farmers who are afflicted with ASF choose to keep to themselves and secretly sell the diseased animals, which further spreads the illness. Pig farmers are often confused by inconsistent policies regarding disease management techniques, which makes illness prevention and control challenging.

i. Limited access to superior breeding stock: In the majority of African nations, there is limited access to superior genetics and genetically upgraded breeds. This has affected productivity and is the cause of the large differences in pig meat yield between nations such as South Africa, which primarily produces better breeds or hybrids, and others that mostly raise non-distinct varieties. The profitability of the pig industry as a whole as well as the productivity and efficiency of pig farming systems can be impacted by access to quality breeds.
ii. Inadequate infrastructure: The growth of the pig business may be impeded by inadequate infrastructure, which includes waste management systems, transportation networks, cold storage facilities, and processing units. Due to these infrastructure constraints, it is challenging to move pigs and pork products effectively, which raises costs and restricts farmers' access to markets.
iii. Exorbitant and fluctuating input costs, including those for medications and feed: One of Africa's biggest problems is the cost and accessibility of high-quality pig feed and medications. Commercial feed can be expensive, particularly if it contains imported ingredients. Pig farmers in Africa often have inadequate knowledge of the nutrients that pigs need and inadequate knowledge of how to formulate feed. Given that pigs normally need a balanced combination of energy, protein, and other vital nutritional sources, this information gap affects the economics of pig farming. It is not necessary to offer a high-quality diet to native pigs that can survive on subpar feed. However, premium feed is necessary for imported breeds and hybrids. In the majority of African nations, high-quality commercial or branded meals for pigs are scarce. Good breeds and the availability of high-quality feed or feed components will boost Africa's pork production. Furthermore, poor infrastructure and storage facilities for medications and pharmaceuticals, as well as feed ingredients, can cause feed spoiling, which reduces the materials' efficacy.
iv. Limited access to veterinary care: Availability of high-quality veterinary In many regions of Africa, access to services such as immunization programs, disease diagnosis, and treatment is frequently restricted [17]. This can make pig producers more susceptible to disease outbreaks and result in large financial losses by impeding attempts to prevent and manage disease. In pig farming, putting in place efficient biosecurity measures to stop the spread of illnesses is essential. However, it can be difficult to contain disease outbreaks and preserve healthy pig populations

due to a lack of knowledge, insufficient funding, and subpar biosecurity procedures.
v. Insufficient technical expertise: For small-scale pig farmers, who make up the majority in most countries, limited access to training and technical information about contemporary pig farming techniques and their adoption has remained a difficulty. Lack of knowledge in areas like artificial insemination, breeding, nutrition, housing, and biosecurity measures has hindered productivity and made it more difficult to implement better agricultural methods, which has led to a decline in efficiency and productivity.
vi. Market and cultural factors: In several African nations, the demand for pork has been influenced by religious convictions and cultural preferences. Pig farmers have had restricted market prospects due to cultural taboos surrounding the consumption of pork and preferences for other types of meat. Additionally, weak value chains and restricted market access have made it difficult for the pig sector to flourish. This is due to the fact that the profitability and sustainability of pig production have been impacted by market accessibility issues, inadequate processing and storage facilities, and poor market relations.

Climate challenges

High ambient temperatures, increased precipitation pattern variability, and other weather extremes are linked to an increase in greenhouse gas (GHG) production and concentration in the atmosphere [18,19]. The productivity of livestock species, including pigs, is impacted by these changes and related variations in climatic conditions throughout time, which are referred to as climate change. Pig production and associated activities account for 10.1% of the entire animal contribution to GHG production, while livestock are consistently involved in producing 14.5% of all anthropogenic GHG emissions [18,19]. Due to its excessive reliance on rain-fed agriculture [20], Africa's agriculture, especially pig production, is susceptible to climate fluctuation, making it one of the world's most vulnerable regions to the negative consequences of climate change [21, 22].

Climate change is expected to have a negative impact on water availability and use for crop (feed) and livestock production [23, 24]. While water availability is decreasing, the amount of water required per pig for intake and cooling—particularly to counteract the effects of rising temperatures—is increasing.

The supply of plant-based feed resources, particularly grains, is also being adversely affected by the decrease in water availability, which is leading to shortages and higher commodity prices per unit. In certain regions of Africa, drought and desert encroachment exacerbate the impact of climate change on pig productivity. For instance, Namibia has been suffering from drought, which has had a detrimental impact on the nation's pig and other agricultural production activities [21, 25].

According to research, one of the main causes of rising ambient temperatures is climate change. This causes thermal stress, which has a greater detrimental effect on pig performance than cold stress, particularly in Africa. Pigs are particularly stressed by heat [26]. Heat stress, which is brought on by high ambient temperatures and high humidity, reduces pig production productivity by influencing growth rate, reproduction efficiency, and the animals' overall health and mortality.

One significant tactic that might be investigated to lessen the impact of climate change on pig production in Africa is breeding for high adaptation and heat tolerance utilizing native breeds of pigs. Adequate cooling equipment and management techniques are necessary to lessen the impacts of heat stress on pig production in Africa, nevertheless, as animals might not be able to completely adapt to climate stressors alone [18,26]. Farmers may make climate-smart farming decisions, prevent losses, and improve grain output and supply by forecasting seasonal climate variations and promptly communicating the information to them. In addition to being impacted by climate change, pigs contribute to it by producing greenhouse gases. Therefore, effective management techniques to reduce greenhouse gas emissions from pig farming and associated activities and to lessen the impact of climate change on pigs are both crucial for increasing pig output in Africa [18].

Opportunities, prospects, and a catalyst for improved pig production in Africa

Prospects and opportunities of pig production in Africa

In Sub-Saharan Africa, pig farming offers a number of opportunities and potentials that can support local populations' better livelihoods, food security, and economic growth. Building a strong and sustainable pig value chain is essential to achieving Sub-Saharan Africa's full pig production potential.
i. Food security: Unlike most livestock species, pigs are extremely prolific and transform feed into consumable meat. This makes them an ideal animal for producing high-quality and high-quantity meat, particularly to address the problem of malnutrition caused by a lack of protein, which is common across most of Africa. Additionally, since pig meat is high in protein, raising pigs for meat can help diversify diets, providing customers with more meat options and improving food security.
ii. Employment opportunities: The breeding, management, processing, and marketing phases of the pig production value chain can generate jobs for both skilled and unskilled laborers from Africa's rapidly expanding population. These include farmers, technicians, traders, farm managers, experts in various facets of animal production, processors, suppliers of inputs, craftspeople, facility managers, logistic operators, and local market sellers, to name a few. Because pigs require less area and initial investment than other livestock species, women and young people can engage in pig production operations [27].
iii. Foreign exchange earnings and income generation: Pig production is a very profitable business with strong returns on investment. Because it gives small-scale farmers a reliable source of income, pig farming has the potential to have a major impact on per capita income in Sub-Saharan Africa. Pigs' strong growth rate, quick generation interval, and quick reproduction rate enable regular sales of pork and piglets, which support a steady flow of revenue [28]. Although most African nations raise pigs for their own consumption, exporting them to other nations or beyond the continent can also generate foreign exchange profits. The potential for foreign exchange profits from pig

production is indicated by the current discrepancy between the worldwide market's supply and demand for pork. Potential for higher income generation through pig rearing is indicated by the anticipated rise in demand for pork products brought on by population growth and shifting dietary preferences [28]. iv. Opportunities for investment: Investment in pig farming has proven profitable due to the pigs' innate capacity for reproduction and development as well as advancements in production methods over time. Despite its growth, Africa's pig industry has not been able to maximize its production due to a lack of investment in infrastructure and technology. In many emerging nations, the demand for meat has also increased due to urbanization and shifting dietary habits [13]. This gives producers the chance to satisfy the demands of the local market while also maybe looking into international markets for pig products. Africa's pig production offers investment potential in all stages of the value chain, including but not limited to breeding, housing, feed production, animal aggregation, processing or value addition, cold storage, transportation, and appropriate retailing locations. Africa offers vast potential for pig value addition, but it hasn't been fully utilized. Making sausages, cured goods, and other value-added products from pigs can increase profit margins, improving farmers' and processors' total revenue. This increases trade and economic activity by giving farmers the chance to reach both local and regional markets. There is potential for additional revenue development if the demand for pig products rises as a result of population growth and shifting dietary preferences [29]. The possibilities for pig production in North African countries are based on the growing demand for pork, which is fueled by tourists visiting the region and seeing pig production as a way to earn foreign cash by exporting it to countries where there is a growing need for pork.

Pointers to better future

Africa's population is expected to grow to around 2.5 billion people by 2050 [30], and they must be fed. This suggests that there is a greater need for food, including pig flesh. The necessity for modern or mechanized pig farming methods to boost productivity and production in response to the growing demand for pork has resulted from the rural-urban movement that has reduced the number of farmers. Both government and commercial entities have recently boosted their investment. Africa has the potential to become a global supplier of pork if it has adequate infrastructure, high-quality inputs, and sufficient agricultural land. After all, the United African Company (UAC) built the biggest pig farm in the world in 1943, and it was situated in Kano, Nigeria. In the 1950s and 1960s, the farm expanded to a very big size, and before being exported from the continent, the pig meat was rail-transported to Lagos, which was then Nigeria's political and commercial center. Unfortunately, religious discrimination led to the pig farm's final closure in the late 1970s [13].

The demand for meat, especially pork, is rising due to variables such population expansion, urbanization, and incomes [31]. The need for greater investment in pig production is indicated by these rising demands. For instance, there is a sizable and expanding market for pork products due to the fast urbanization and population expansion that is occurring in East African cities and in nations like Nigeria. Opportunities to meet the growing urban demand for meat products, notably pork, are presented by this. For the advantage of both producers and consumers, coordinated efforts can ensure or guarantee the safe and legal commerce of pigs and pork products.

Changing the industry from the old practice of scavenging pigs to a more profitable manner is also necessary to increase pig production in Africa to satisfy the demands of the growing population. This calls for the involvement of companies or actors who will offer farmers access to contemporary living facilities, better breeding stock, better feeding systems, and training on new pig production techniques like artificial insemination. The use of methods that are extensively utilized in Africa is still low compared to Europe and America because of a lack of infrastructure and expertise. Opportunities for commercial feed production or input supply are also abundant in the feed business. Commercial pig feed is rarely available to farmers, who are primarily ignorant of feed formulation.

Pigs are typically sold live by farmers to nearby slaughterhouses throughout the majority of Africa, where the product receives little to no value addition. To realize the full potential of the business, significant investment is required in the processing and value addition of pigs in Africa. Private institutions and development partners' investments in pig production and processing have grown significantly in some African nations, including Liberia and Kenya. To spread best practices, disease control methods, and contemporary pig farming techniques to farmers, research and extension services must be funded [8,13].

Abundance of agro-industrial by-product in Africa

Pork and other livestock products are becoming more and more in demand as Africa's population increases and becomes more urbanized. Demand has increased as a result, placing strain on the supply and cost of traditional pig feed. African pig producers frequently purchase feed materials from local and international marketplaces. The availability and cost of imported feed ingredients, for instance, have been impacted by the disruption of global grain markets caused by the Ukraine-Russia conflict [32]. Conflicts between farmers and herders, for example, have severely impacted the economy in Nigeria and other West African nations by disrupting local agricultural production and lowering the supply of locally derived feed ingredients. Pig farmers' finances have been stressed by the rise in feed costs brought on by interruptions in the global grain market. Local disputes have also resulted in lower agricultural output, which has an impact on smallholder farmers' incomes and the availability of local feed ingredients. Conflicts between farmers and herdsmen frequently result in the uprooting of farming

communities, when farmers are compelled to leave their lands or scale back agricultural operations because of insecurity [33]. Due to interruptions in local and international markets, higher feed prices, and decreased agricultural production, the Ukraine-Russia conflict and farmer-herdsmen conflicts in Nigeria have contributed to the scarcity of feed ingredients for pigs in Africa. These crises demonstrate how regional and global forces interact to shape the difficulties African pig farmers experience in obtaining a sufficient and reasonably priced supply of feed components. To address these feed shortage issues, there is a chance to increase the usage of agro-industrial by-products as substitute pig feed sources. Numerous by-products are produced by Africa's agricultural industry from crops such as rice, oil palm, cassava, sorghum, corn, soybean, peanut, wheat, and sugarcane. These byproducts consist of materials that can be used as valuable pig feed ingredients, such as bagasse, rice bran, rice husk, soybean meal, corn bran, groundnut cake, palm kernel cake, brewer's grain, and wheat offal. Since many of these agro-industrial by-products are high in fiber, protein, and energy, they can be fed to pigs [34]. On the other hand, their nutritional content can be increased with appropriate processing and supplementation. Making use of these by-products helps to make agriculture more environmentally friendly and sustainable while also reducing waste.

CONCLUSION

A common practice throughout Africa, pig production has made significant contributions to the continent's agricultural economy, particularly as a source of income for many of its rural residents. Pig production in Africa still has the potential to become a major contributor to the continent's GDP and the achievement of the Sustainable Development Goals on Zero Hunger and Poverty Eradication, despite the obstacles it faces. This is because pigs are a good source of animal protein that can help fill the protein gap in the rapidly expanding African human population. Smallholder farmers must be given capacity building in the areas of appropriate feeding and feed management, health management, biosecurity, and value addition to boost productivity and the growth of the pig value chain throughout Africa in order to unlock the continent's hidden pig production treasure. The expansion of pig production in Africa depends on the implementation of suitable regulations that encourage the formation of private pig meat processing facilities or firms. It is crucial to do ongoing research on the creation of highly adaptable breeds, cost-effective feeding systems, and the utilization of alternative feed resources or agro-industrial by-products. The expansion of the pig business in Africa depends on the careful planning and implementation of disease surveillance, preventive, and control strategies.

CONFLICT OF INTEREST

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