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Review

Unpacking the Multifaceted Benefits of Indigenous Crops for Food Security: A Review of Nutritional, Economic and Environmental Impacts in Southern Africa

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Abstract: Indigenous and traditional food crops (ITFCs) are essential to initiatives aimed at increasing food and nutrition security and diversifying the food supply. Therefore, the study sought to evaluate the benefits associated with ITFCs particularly on food security. The *Vigna subterranea* (Bambara groundnut), *Vigna unguiculata* (Cowpea), *Colocasia esculenta* (Taro), and *Sinapis arvensis* (Wild mustard) are examples of indigenous crops that were introduced for food security in Southern Africa. This review assessed the advantages of indigenous crops for food security and examined literature, reports, and case studies from 2009 to 2024 using academic databases like Scopus, Web of Science, JSTOR, Google Scholar, and AGRIS to assess how indigenous crops impact on food security and benefits thereof. The primary inclusion criteria were nutritional, economic and environmental impacts of the indigenous crops for food security in Southern Africa. The review concludes that maximizing these benefits requires removing obstacles through capacity-building and policy reforms. The need to integrate precision agriculture to increase production of indigenous crops should be considered and the coherent use of food crops associated with food security must be developed by government. A comprehensive strategy centered on investments in sustainable farming, climate smart agriculture is recommended to ensure food security.

Keywords: Indigenous crops; food Security; poverty alleviation; climate smart agriculture; sustainable farming; policy reforms

1. Introduction

The global food system has changed significantly over the last 50 years [1] due to declining agricultural productivity in the Global South and the depletion of indigenous and traditional food crops (ITFCs). Since the Green Revolution in the 1960s, agriculture has mostly focused on creating traditional horticultural and cereal crops. Consequently, the creation and production of ITFCs were severely undervalued as these foods became popular and replaced many locally grown crops [2]. Foods with less nutrients have replaced ITFCs, which were once widely consumed, because of this transition spreading so widely over the world, increasing health-related problems [1]. For millennia, ITFCs were a significant source of food for communities. However, because colonists perceived them as the diet of the poor, these foods and their eating habits were displaced during colonization [3]. Research and extension have categorized traditional leafy vegetables in Southern Africa as weeds since the 1960s; this unfortunate classification has stigmatized these crops, especially among young people [4]. It has led to a decline in the use of these wild food sources and the dissemination of information about plants in many societies. These days, three major staples—rice, maize, and wheat—provide more than half of the world's daily protein and calorie needs. [6]. Additionally, 80%

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to 90% of our total dietary intake comes from 12–20 species [7]. Although this ensures adequate calories, it inadvertently ignores the need for a diverse diet and essential nutrients [8]. ITFCs are more varied than exotic cuisines because 7000 species have been used as food sources and for other reasons throughout human history [9,10]. Given the demand for dietary diversity and continuing worries about environmental effects like climate change, ITFCs are ideally situated to provide food options that could enhance nutrition, increase dietary diversity, and be climate change adapted [11]. According to the literature on mainstreaming agrobiodiversity for sustainable food systems [12], the benefits of ITFCs in promoting more equitable and sustainable food systems can be categorized into four main areas: environmental benefits, like the potential for ITFCs to withstand drought in the face of climate change [13], and nutritional benefits, like the potential for higher nutrient densities than in other foods [14]. Economic advantages include the support of livelihoods and income from ITFC sales [10], as well as social and cultural advantages including the connection between indigenous foods' nutritious content and local knowledge [15].

Despite these obvious benefits, however, little research has been done on the usage of traditional foods in Africa.[16]. Few are used commercially [5], mostly due to human perceptions, cultural norms, and a lack of customer awareness of their benefits [17]. In addition to offering a great opportunity to diversify the diet, traditional foods serve as a source of history, a brand, and a cultural symbol. These cuisines play an important role in shaping the cultural identity of many ethnic communities [18,19]. Preserving a range of culinary practices, particularly those pertaining to food preparation and consumption, is essential because this knowledge can be readily lost over a few generations [20]. There is a significant possibility that knowledge of ITFCs is already dwindling, and that knowledge could include crucial techniques for farming [20].

The loss of food sovereignty and the capacity to govern their own food system and management have resulted in several recorded cases in the African context where communities have faced food insecurity [21]. This is evident in the context of other emerging countries, like Mexico, where rural people have encountered several issues that have caused them to become less independent and more dependent on food chains that manufacture goods [22]. Likewise, in most African nations, the ethnobotany [25]. The wild food resources are inconsistent and inadequately recorded; it consists primarily of lists of plant names, offering scant to nonexistent data regarding its administration and use [11,23]. Researchers argue that the industrialization of food and the formalization of markets in countries such as Southern Africa have resulted in a decrease in the use of long-established, domesticated wild plants and foods that had been reliable for many years, even though native food plants have historically played a significant role in the diets of African communities [24].

According to Balinga [25], traditional foods have been marginalized for a number of reasons, such as a lack of awareness of their economic worth, the extent to which they are utilized and significant in rural economies, the fact that most of them (apart from a few products) do not have global markets, irregular supply, quality standards, and technological advancements in processing and storage [20]. Although native food plants have, according to academics, there are still large gaps in the knowledge of native foods in Africa. There is a dearth of information on ITFCs, especially in sub-Southern Africa, despite the World Trade Organization (WTO) declaring that "Indigenous agriculture and biological resources are vital important to the economies, cultures, environment, food security and livelihoods of sub-Southern Africa" [26]. Without this vital information, the demand for ITFCs cannot be adequately realized or investigated [16]. Research by scientists like Mbhenyane [16] indicates that if native plants were better understood and used more frequently as staple foods, there might be a lot of promise for African food systems and food security [27]. It is evident that more research in this field is necessary to add new knowledge to science and raise awareness of the conventional usage and management of ITFCs [11]. To support the claim that these foods can support food and nutrition security on the continent, we hope to synthesize the information currently available on ITFCs in Africa in this study [28]. Additionally, we hope to highlight any knowledge gaps that require immediate attention.

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Problem Statement

People in Southern Africa still experience food insecurity despite the region's wealth of locally grown fruits and vegetables [29]. It seems that they don't think highly of these foods and their ability to end hunger and poverty, improve nutrition and health, and bring in money for families [5]. Traditional foods including cowpeas, pumpkin leaves, Bambara groundnuts, and green leafy vegetables are becoming less popular in most Southern African nations [30]. Among the factors contributing to this loss are the westernization of African diets, the bitter and sad taste of wild vegetables, culture, and the perception that wild vegetables are inferior meals [31]. A lack of interest in studying indigenous foods or the elder generation's failure to instruct the younger generation on how to identify, gather, prepare, and preserve them have also been blamed for the decline [32]. Commercial farming is another. Because these foods have received little attention from research and development, they are not as competitive as well-known big crops [38]. A comprehensive analysis of data from 2011 to 2021 regarding the accessibility of native foods in Southern Africa, together with the elements that influence their use, was carried out to determine the laws governing the use, preparation, harvesting, and preservation of native foods [33]. These foods were more commonly consumed in rural areas, primarily by the elderly and jobless. Certain indigenous vegetables derived from multipurpose plant species are used as food and medicine to support health, according to studies in our systematic review [34,35]. There are also a variety of beverages derived from local foods, such as herbal teas, fermented non-alcoholic beverages, and traditional beer [36].

A lack of information about sustainable agricultural practices, high transaction costs, and restricted market access are only a few of the many issues facing smallholder farmers in Southern Africa [5]. These obstacles frequently prevent smallholder farmers from using sustainable agricultural practices, which are crucial for improving resilience to climate change and food poverty [6]. Food security crops can help to reduce these challenges by lowering transaction costs, connecting farmers to broader markets, and providing timely access to vital information [10,13]. The growth of food security crops has facilitated the expansion of farming platforms across Southern Africa. Indigenous crops pertaining to food security are also essential for disseminating information regarding sustainable agricultural marketing [29]. For example, food security crops might provide real-time guidance from agricultural experts, best practice guidelines, and training modules. Through these crops, smallholder farmers can learn about water conservation techniques, crop rotation, and organic farming, all of which are essential for sustainable agriculture [10]. By creating a community of practice that encourages innovation and learning among the stakeholders, this information exchange benefits smallholder farmers [37]. Furthermore, smallholder farmers now have the financial means to engage in sustainable agriculture as food security crops incorporate integrated services like extension education.[39] Therefore, the study seeks to unpack the multifaceted benefits of indigenous crops for food security in Southern Africa.

2. Methodology

2.1. Research Design

Using a systematic review methodology, the benefits of indigenous crops for food security among Southern Africa were reviewed. To summarize the study and identify trends, gaps, and new material from various literature sources, a systematic review was a suitable method [19]. This strategy made sure that the subject's level of expertise was thoroughly and objectively assessed. To ensure a high-quality summary and recommendations, the systematic review process involved the following steps: (i) developing the research questions; (ii) locating relevant literature for the review; (iii) assessing the quality of studies using appraisal guidelines; (iv) synthesizing data to summarize the evidence; and (v) interpreting the results [15].

2.2. Data Collection

Reputable academic databases like Scopus, Web of Science, JSTOR, Google Scholar, and AGRIS provided content for the review. Additionally, reports from organizations like the Food and

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Agriculture Organization (FAO), World Bank, International Fund for Agricultural Development (IFAD), and other regional organizations that monitor agricultural and socioeconomic development in Sub-Saharan African nations were consulted to find pertinent grey literature [29]. Many search terms were utilized, including SSA, sustainable agriculture, smallholder farming, market access, agricultural practices, and indigenous crops for food. To guarantee a comprehensive and wide search, these terms were combined in a variety of ways. Research on South Africa (SA), studies performed in English, studies conducted between 2021 and 2024, and studies on the impact of food security initiatives on agriculture were the focus of the study. Peer-reviewed articles and reports were also examined. Finally, research focusing on areas outside of SA, non-English publications, and studies irrelevant to the impact of e-commerce on agriculture were omitted.

2.3. Data Extraction

By concentrating on the topic and abstracts of the papers, the first search turned up some potentially interesting ones. Two re-viewers independently checked the eligibility of these articles. Disagreements were resolved by discussion or the involvement of a third reviewer. Key data was extracted using a standardized data extraction form from each of the chosen studies. This data included the name and year of the author(s), the study's location, the goals and methods of the research, the sample size and composition, the main conclusions about income, market accessibility, and sustainable practices, as well as the obstacles and enablers detected.

2.4. Data Analysis

Thematic analysis was used to identify and assemble the main topics from all the included papers. To identify recurring themes and classify the recovered material into more generic groups, they were coded. The institutional repositories of many tertiary institutions were also used to access academic journals, with pertinent scientific materials, from University of Mpumalanga library and University of Free State, South Africa. While simultaneously depleting its Digital, Cat Plus, and Online Public Access CatLog (OPAC) collections. The following search criteria were noted by the authors: (1) Only English was used as the language format for the chosen scientific papers; (2) agriculture and food security, as well as the role of indigenous crops for food security, were the subjects of the scientific materials found, and their contents were related to the main goals of this review paper; (3) the articles were gathered from reputable, peer-reviewed, and standard journals. To find relevant articles, several keywords and phrases were used. To eliminate content that was unrelated to the paper's subject, the authors separately reviewed the abstracts, keywords, and paper themes. They also read articles section by section. In the end, sixty scientific publications and grey literatures from 2009 to 2024 were chosen for usage; fifty of them were published in fifteen peer-reviewed journals, and twenty-eight of them dealt with food security.

3. Benefits of Indigenous Crops for Food Security in Southern Africa

Local communities benefit greatly from food security crops in terms of climate smart agriculture Indigenous crops for food security, assist communities in becoming self-sufficient [33]. World Health Organization (WHO) and the Global Food crisis (2008) contends that poverty and hunger situations which people face daily are the reasons why crops were established [22]. Food security crops provide equal opportunities for small and medium-sized enterprises (SMEs) and large corporations to compete in the global market. Furthermore, these native crops facilitate the smooth integration of local companies and communities into global social, economic, and cultural networks. [21]. Crops' significance will only increase as they develop further, propelling an environmental and sustainable revolution that will significantly affect human society and outstrip the Industrial Revolution in both scale and depth. [40]. It will change people's lifestyles, perspectives, and methods in addition to increasing productivity and efficiency, making it a revolutionary force in human history. The utilization of food security crops in agriculture enables farmers to practice sustainable farming and reduce land exploitation [41].

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3.1. Nutritional Benefits of Indigenous Crops for Food Security in Southern Africa

Indigenous food crops play a vital role in various societies, particularly in diversifying food sources to enhance food and nutrition security [1]. These crops, originating from Africa or naturalized through introduction, offer a rich source of traditional nutrition [10]. Notably, research reveals that only 8% of Africa's indigenous crops were introduced, while over 90% have ancient origins on the continent [1]. Globally, 820 million people suffer from undernourishment, with 239 million of these individuals residing in Sub-Saharan Africa (SSA) [7].

Consequently, nutritional risk factors contribute to approximately 11 million fatalities annually, with hunger increasing in Western Asia, Latin America, and Africa. Moreover, inadequate fruit and vegetable consumption has led to nearly two million deaths, with 500,000 occurring in South Africa alone [8]. A diet lacking essential fruits and vegetables increases the risk of strokes, heart disease, and cancer [3]. Therefore, revisiting Southern Africa's indigenous foods is crucial to addressing regional food insecurity. Indigenous crops have gained global attention for supporting sustainable diets and improving nutrition. Studies demonstrate that consuming diverse indigenous crops leads to higher intakes of micro- and macronutrients, enhancing food security [4]. In Southern Africa, about 33 indigenous crops are regularly consumed, with Amaranthus viridis., Cleome gynandra, Citrullus lanatus (watermelon), and Bidens Pilosa (blackjack) being the most popular [1]. Vigna unguiculata (cowpeas) and Ipomoea batatas (sweet potatoes) are considered traditional due to commercial production and accessibility. Similarly, research in Zambia and Malawi indicates sweet potatoes, amaranthus viridis., and Cleome gynandra are frequently traded and consumed [5]. To prepare indigenous crops, various methods are employed, with cooking being the most common technique for enhancing flavor and digestibility. Additionally, boiling leaves or frying vegetables are preferred methods in Malawi [6]. In addition, indigenous crops, found particularly in Sub-Saharan Africa, are crucial for improving food and nutrition security, promoting sustainable diets, and reducing food insecurity, thus enhancing overall health outcomes.

Table 1. Micro and Macro-nutrient value of ITFC's.

Type of ITFC's	**Nutrient**	**Distribution**
Amaranthus viridis	Zinc, Iron, Phosphorus And Magnessium	South America
Cleome gynandra	Ascorbic acid and Lutein	South and East Africa
Citrullus lanatus	Sodium, Potassium and Magnessium	South and Western Africa
Bidens	Copper, Magnessium	Southern Africa
Pilosa (Blackjack)	Iron and calcium	South America and Southern Africa
Vigna subterranea	Calcuim, Iron	West Africa

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(Bambara groundnut)		Central African Replublic and Southern Africa
Vigna unguiculata (Cowpea)	Calcium, Magnessium	East and West Africa
Ipomoea batatas (Sweet potatto)	Potassium	Southern Africa
Colocasia esculenta (Amadumbe)	Potassium	Southern Africa
Sinapis arvensis (Wild mustard)	Iron, Calcium, Zinc, Manganese	North Africa

3.2. Economic Benefits of Indigenous Crops on Food Security in Southern Africa

Numerous traditional vegetable species have a high economic value; sales of these products can significantly impact household income and standard of living. Examples of these are such as cowpeas, sweet potatoes, amadumbe, and imifino (morogo). According to Masuku and Bhengu [42], most small-scale farmers that grow native vegetables in rural areas are unemployed, production is a major source of income for them, and it has a good potential to increase the economy of the locals and create job opportunities for rural people who are poor. Masekoameng and Molotja [43] states that farmers produce indigenous crops for consumption and sell the surplus to regional and local markets to contribute to the household income. In urban areas the consumption of native foods is reduced by their lack of availability in many stores and cities because most of the producers are rural framers with lack of access to market. According to Mbheyane [44], several supermarkets are selling pricey indigenous foods to customers in such areas.

Ebert [45] states that, many rural households now depend heavily on the commercialization of locally grown vegetables as a source of income, because the expansion of export will boost the national economy while increasing export revenue. Native vegetable crops in Africa frequently exhibit exceptional environmental adaptation (abiotic and biotic variables), low input requirements, cropping system compatibility, easy seed production, convenient harvesting, and traditional post-harvest methods, for communities that are economically disadvantaged, farming becomes more sustainable because of the decreased financial strain on farmers and increased profitability [46].

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3.3. Environmental benefits of indigenous crops on food security in Southern Africa

Indigenous crops, often referred to as traditional or underutilized crops, are important for maintaining food security, especially in areas with harsh weather conditions [47]. Indigenous crops are important in the battle against poverty and malnutrition due to being frequently more adapted to local climates and ecosystems than conventional crops [48]. The nutritional variety of indigenous crops is one of the main means of supporting food security. Nutrients such as proteins, vitamins, and minerals are abundant in many indigenous crops, including sorghum, millet, cassava, and amaranth [49]. This is especially crucial in areas where diets depend mostly on a small number of staple foods that could not offer enough nutrients.

Indigenous crops are not only very nutritious but are also very resistant to climate change [49]. Communities can improve food security in areas sensitive to climate-related disruptions by cultivating these resistant crops, which would lessen their reliance on non-indigenous crops and minimize climate-related hazards. Additionally, indigenous crops provide agricultural biodiversity, which is necessary for robust food [50]. The small variety of high-yield staple crops that are frequently the emphasis of modern agricultural practices such as wheat, rice, and maize, can result in a loss of biodiversity [51]. Due to their reliance on a small number of crops, food systems are more susceptible to illnesses, pests, and climate change. On the other hand, indigenous crops decrease the hazards connected with monoculture farming by bringing variety to agricultural systems [52]. Owing to the range of crops that may be harvested at different seasons and flourish in diverse environments, biodiversity guarantees a more dependable food supply [53]. Therefore, encouraging the growth of indigenous crops can strengthen food systems' resilience and provide as a safety net against food shortages.

Lastly, indigenous crops are better for the environment compared to traditional farming methods due to their minimal input needs. When compared to current crop varieties, indigenous crops usually require fewer synthetic inputs, including chemical pesticides and fertilizers [1]. This is a result of their superior soil adaptation and inherent resistance to a variety of pests and illnesses. Because of this, growers can use fewer chemical inputs, which decreases production costs and lessens the harm that chemical runoff into water bodies does to the environment [54]. This decreased reliance on inorganic and carbon-emitting inputs promotes more environmentally friendly agricultural methods that protect soil quality and cut down on pollution.

3.4. Emphasis of Sustainable Practices, Knowledge Sharing, and Capacity Building

Indigenous crops aimed at ensuring food security could play a major role in motivating smallholder farmers to adopt climate smart agricultural practices [40]. Users often get access to a wealth of information about ecologically friendly farming methods, such as precision agriculture, organic farming, and integrated pest management, thanks to these crops [55]. Farmers can participate in virtual training events, webinars, and online resources to learn about strategies that can reduce their environmental effect while increasing productivity in the long run [56]. Farmers are more likely to employ precision agriculture methods, for example, which use technology to maximize crop growth at the field level. Furthermore, crops for food security might facilitate access to sustainable inputs [57]. Farmers may easily purchase environmentally friendly products including energy-efficient machinery, organic fertilizers, and biopesticides [58]. The fact that these inputs are accessible online encourages the use of ecologically friendly farming methods that raise the quantity and caliber of agricultural production [23]. Through the promotion of sustainable inputs and practices, food security crops help farmers reduce their ecological footprint, enhance the health of their soil, and ensure the sustainability of their farming operations for future generations [59]. Furthermore, capabilities that support the capacity-building and knowledge-sharing of smallholder farmers are commonly included in food security crops [60].

These crops can provide farmers with valuable information on soil health, pest management, modern agricultural practices, and other subjects [30]. Because of these native crops, farmers are more equipped to apply innovative methods that can increase agricultural output and encourage sustainability [25]. A culture of ongoing learning and development can be fostered by introducing

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farmers to new knowledge and practices through webinars and online training sessions conducted by experts in agriculture [61]. Peer-to-peer learning and community development are further benefits of food security crops. Through social media groups and online forums, farmers can communicate with one another, exchange experiences, and ask questions [62]. This collaborative environment facilitates the sharing of practical knowledge that can be applied immediately in the field. By fostering a sense of community, food security crops assist farmers in problem-solving and innovation, leading to more resilient and sustainable farming techniques. To address common issues and foster agricultural development, the combined expertise of a farming community can be highly valuable [63].

3.5. The Implications of Indigenous Crops for Food Security

Indigenous crops addressing food security have an influence on various sectors, including enhanced productivity, improved traceability and stakeholder participation, and management of food wastes [64]. Food waste control, sustainable farming, increased productivity, youth empowerment and agriculture education, and infrastructure development are now the main areas where food security crops are implicated in the agricultural sector [65,66]. Customers' ability to track agricultural products to determine where they were produced, how they were produced, and whether the producer complied with market requirements to produce the type of produce that consumers demand is another indication of how food security crops impact sustainable agriculture practices [67].

In the agricultural sector, the implementation of indigenous crops, together with its guiding principles and instruments, helps farmers increase revenue while cutting expenses associated with production. This is largely because organic farming and conservation agriculture have been implemented, along with concurrent activity reduction [57]. As a result, when smallholder farmers produce any agricultural product, they obtain specifications from their clients, who thereafter have access to the production process data (traceability and transparency). By reducing the gap between farmers, buyers, and suppliers of production inputs, the use of food security crops also improves stakeholder participation in the agricultural value chain [68]. Therefore, by lowering stress, time constraints, and financial strains, indigenous crops not only benefit producers over consumers, but they also contribute to environmental preservation, ensuring that production does not jeopardize the potential and capacity of future generations to produce their own food [59].

4. Initiatives Implemented in Improving Food Security Across Southern Africa

4.1. Government-Led Initiatives

The strategies used by government so far have involved projects for food security such as the Unemployment and social grants amongst others. The integrated food strategy, nutrition, and food safety is vital while providing for improving monitoring and methods and support stronger multi sectorial partnerships thus supporting targeted interventions [4]. Overall, for Southern Africa to maintain and improve food security in a sustainable way the indigenous crops for food security must be central to planning and ensuring there is sustainable innovation in farming [62]. The strategy plan for the Ministry of Agriculture claims that Southern Africa's scarcity of land limits its' potential to increase food production. Aside, agricultural land is being developed into property for homes and companies. To increase food production in Southern Africa, more land should be set aside for growing crops [69].

4.2. Provide More Land for Food Production

The strategy plan for the Ministry of Agriculture claims that Southern Africa's scarcity of land limits it's potential to increase food production [64]. Aside from that, agricultural land is being developed into property for homes and companies. To increase food production in Southern Africa, more land should be set aside for growing crops and breeding cattle [4]. To convince the owners to rent the property out for livestock and agricultural development, this can be accomplished by

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producing an exhaustive inventory of all the land that sugar farmers are abandoning [9]. The information can be made available to planters who need additional land to cultivate more crops. However, a lot of the region's countries are keen to cede territory to South Africa to entice South African investment, according to NESC [34]. For small planters or cooperatives involved in food production and livestock breeding regions, the Southern African government may provide financial assistance for travel abroad. They will be able to identify opportunities for increasing food production in other countries that can be exported to Mauritius by doing this [67].

This exercise may be carried out by the Regional Development Co. LTD. and the Board of Investment, two governmental bodies in charge of promoting both local and foreign investment. As a result, Southern African farmers will be able to use their expertise to increase food production in this sub-Saharan region of Africa [12]. Through the agricultural marketing board, the Southern African government is also able to guarantee a price for the products of these farmers, giving them extra incentives to start producing in these neighboring countries. Because of economies of scale and the cheap labor that is easily accessible in these nations, planters who are farming on a greater scale will be able to produce food at a lower cost due to lower transportation costs [14].

4.3. Integrate Agriculture in School Curriculum

In Southern Africa, the workforce is aging, and fewer young people are interested in working in agriculture, according to studies [15,19]. In this case, the government must arouse youth enthusiasm in the agricultural sector. This may aid future food production as well as the nation's unemployment rate. The value of agriculture can be taught to people at a very young age; hence it should be included in the elementary, secondary, and university curriculum [13]. Primary school children might receive gardening instruction as part of extracurricular activities scheduled by the institution. The establishment of agricultural groups might be encouraged, and all secondary students must be taught about agriculture [30]. The government can also provide funding for the installation of hydroponic facilities in every secondary school in the country to encourage alternate methods of food production [27]. The idea of agribusiness needs to be promoted at the tertiary level to boost the number of young people interested in starting degrees in this field. Encourage people to start doing their own gardening. Government officials in Southern Africa must encourage people to start backyard gardens [37]. Consequently, there may be less food insecurity in South Africa [25]. Press and national television commercials emphasizing the advantages of home gardening for Southern African homes must be deployed. The ministry of agriculture can also provide technical advice on how to grow crops and raise animals at home. The spread of drought-tolerant crops can be encouraged because water is scarce in urban areas [70]. This can result in households spending less on fresh vegetables. Additionally, this move might help to reduce international imports of specific foods [71].

4.4. Reduction in the Wastage of Food

The Southern African governments might arrange for adverts in the local press and newspapers to increase public awareness of the nation's concern over food security and to encourage residents to reduce food waste [69]. This could help reduce the amount of food imported from other countries. There is a paradox in Southern Africa where many people waste food while others are living in poverty. Inspiring Southern Africans to donate extra food to those in need will help to reduce the country's undernourishment [62]. The second most critical intervention area for the campaign to avoid food waste was found to be negligent food storage. According to our desktop research, impulsive or unplanned food purchases are less important [72,73]. Since it obviously contributes to negligent food storage, it is nevertheless worth mentioning as a pertinent issue.

4.5. Improvement of Hygiene and Safety Standards in Food

The food safety process reveals that many people have serious concerns about the quality of the food available in Southern Africa. They claim that Southern African cuisine is not hygienic or nutritious despite being extensively available [74] Southern African food vendors frequently flout

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hygiene laws, which could be dangerous for the local population's health. Recently, many Southern Africans have become ill from eating contaminated food [48]. In Southern Africa, numerous regulations have been created to protect consumers from such risks, but the fundamental problem is still how to enforce them. Representatives of the government assert that this situation is due to a lack of manpower [66]. The government must in this instance inform food producers of the dangers posed and the safety precautions that need to be taken to prevent such occurrences [43]. The recommendations will be further communicated to stakeholders through emails, presentations, noticeboards, regular meetings via video or in person.

5. Food Security Policy Implication for Southern Africa

Southern Africa urgently needs a food security policy for these additional reasons. First off, there are several conceptual definitions and interpretations of food security among the major players (government, the international community, research institutions, and civil society) [67]. As a result, there is disagreement over the diagnosis, prognosis, and solutions related to food security, which eventually affects program design. A food security policy is required to outline the essential components and scope of the idea in an inclusive manner that considers all opposing viewpoints [36]. Common understandings and widespread ownership can be attained in this way [40]. Second, food security is a multifaceted problem that involves interdisciplinary approaches, functions at several levels, and necessitates various actions depending on the circumstances. The intended impact of these programs is defeated by the lack of a comprehensive policy framework that would allow them to be coordinated and redirected to regions with the highest levels of food insecurity [26].

Thirdly, Southern Africa makes a significant contribution to regional food security as a member of the Southern African Development Community [SADC]. A food-insecure neighbor will significantly affect Southern Africa's food security status; thus, this policy is necessary to decide on solutions for the nation and outlines its planned international engagements to help the region be food secure [32]. Improving South Africa's stability and sufficiency of access to wholesome food at the national and family levels is the strategic aim of the Food Security Policy. The goal of this policy is to decrease the 11.5 million people in Southern Africa who have inadequate to extremely inadequate access to food [75]. To provide markets for community food production initiatives, such as Ilima/Letsema, LARP, land reform, and farmer settlement, this policy calls for reprioritizing government procurement of food and increasing and better targeting public spending in social programs, education and health services, and public works programs. Additionally, it demands more infrastructure assistance for smallholder farmers [CASP] and more access to production financing for the developing agricultural sector [MAFISA].

Furthermore, the SADC region's nations are distinguished by their uneven development, which encourages population movement [76]. Therefore, to guarantee that the region achieves self-sufficiency, we must also be dedicated to promoting food production, trade, and development in the area. The government's dedication to achieving global food security is emphasized by its commitments to the FAO World Food Summit in 1996, the SADC Dar es Salaam Declaration on Food Security and Agriculture in 2001, and the MDG targets [77]. The goals of the policy are to:

- A sustainable long-term national agricultural production plan should be used to coordinate land reform and agricultural development and to fortify ties between support services.
- Assure resource-poor farmers have access to support services (lower-cost finance and inputs, research data, technology, and market data).
- Encouragement of domestic trade via a program for sustainable food purchases connected to the burgeoning agricultural industry.
- Ensuring the presence of a market environment that will support family and national food security.
- Improving food management and consumption.

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6. Measures to Address Cultural and Social Differences Among Smallholder Farmers

A range of tactics, including information-sharing programs and fostering relationships and trust among small-holder farmers, may be used to address socioeconomic and cultural differences within smallholder farming communities to successfully increase the adoption of food security crops [13]. It is also crucial to provide specialized training programs that consider the unique needs and abilities of smallholder farmers [78]. Enhancing, highlighting the benefits of sustainability, and dispelling any misconceptions or fears regarding sustainable farming should be the main goals of these efforts. When these educational programs are modified to consider local languages, customs, and learning preferences, they have a greater chance of overcoming cultural obstacles. Another essential strategy for bridging social and cultural gaps among smallholder farmers is developing connections and trust. [15]. Smallholder farmers typically prioritize trust-based networks and personal relationships in their business operations. Therefore, it is essential to construct reliable food security crops for these smallholder farmers to boost farm output and ensure timely supply of commodities [79]. Smallholder farmers who are hesitant to use the indigenous crops for food security are thus encouraged by the addition of feedback and dispute settlement procedures [16]. In summary, overcoming the cultural and societal barriers that prevent smallholder farmers from implementing food security crops requires a holistic approach that incorporates relationship-building, education, and trust-building [73]. Therefore, stakeholders may enable smallholder farmers to utilize the advantages of food security crops to enhance production, sustainable farming methods, and livelihood by being cognizant of and sensitive to the difficulties and circumstances they encounter [37].

7. Summary of Study Findings

Indigenous food crops in Southern Africa are foundational to the region's nutritional and food security [80]. They include cereals like sorghum and millet, legumes such as cowpeas and Bambara groundnuts, and leafy vegetables as presented in Table 2. These crops are highly valued for their nutrient density, providing essential vitamins, minerals, and protein to communities that often face malnutrition and food scarcity [81]. In addition to their nutritional benefits, these crops are resilient to drought and poor soil conditions, making them suitable for cultivation in a region increasingly affected by climate change [82]. Culturally, indigenous crops are woven into the traditions and daily lives of Southern African people as they feature prominently in culinary practices, rituals, and traditional medicine [83]. Local festivals and ceremonies often celebrate dishes made from these crops, and their preservation methods, like fermentation and drying, have been passed down through generations [83]. There is also growing economic potential for indigenous crops [84], with markets developing both locally and internationally, especially for products like baobab and marula, which have become sought-after health foods.

Despite these advantages, indigenous food crops face obstacles that hinder their widespread adoption. These include a lack of awareness, limited research, and challenges in market access and infrastructure [83]. Furthermore, agricultural policies often prioritize modern cash crops over indigenous varieties [85]. Addressing these challenges requires a multi-faceted approach that includes policy support, increased research investment, and community engagement. By enhancing value chains and promoting the benefits of indigenous crops, the region can leverage these resources for sustainable agriculture and economic development.

Table 2. Indigenous food crops in Southern Africa and their benefits.

Indigenous food crops in Southern Africa	Benefits	References
Cereals (Sorghum, pearl millet, and finger millet)	Sorghum and millet are rich in fibre, iron, magnesium, and B-vitamins. They also have a low glycemic index,	[86]

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	which is beneficial for people with diabetes.	
Legumes (Bambara groundnuts, marama beans, and cowpeas)	Bambara groundnuts, marama beans, and cowpeas are rich in protein and can be grown with minimal external inputs, making them essential in regions with less fertile soils.	[87,88]
Tubers (Amadumbe/Taro and cassava)	Crops such as amadumbe (African yams) and cassava serve as key energy sources. They are resilient to harsh climatic conditions, which makes them crucial for food security.	[89]
Fruits (Baobab fruit, marula, wild loquats, and mobola plum)	Baobab fruit, marula, wild loquats, and mobola plum provide essential vitamins and minerals and are used in various traditional dishes and beverages such as amarula cream liqueur which is an internationally recognized beverage.	[90]
Leafy vegetables (African spinach, momordica balsamina, and jute mallow)	African leafy greens such as amaranth and jute mallow, are rich in calcium, iron, and vitamins A and C. These are crucial for combating malnutrition, especially among children and pregnant women.	[49]

8. Conclusions and Recommendation

Since the implementation of indigenous crops for food security, the agriculture industry has undergone significant transformation. This has enabled comprehensive yet timely and fruitful discussions between all stakeholders in agriculture, including producers (farmers), buyers (market), industry partners (producers of production input), and research and innovation organizations (like commissions or universities). This study examined the research on the advantages of using indigenous crops for food security for sustainable farming methods, especially for smallholder farmers in Southern Africa. This research examined the multifaceted benefits of indigenous crops for food security on sustainable farming, which uses integrated pest and weed management, and Mixed Farming, which produces both crops and livestock. The market, or the clients, has an impact on these procedures since they determine what needs to be produced and how. The agricultural sector and industry are using indigenous crops more and more, which has ramifications for policy. The need to integrate precision to increase production and efficiency makes this necessary. The market necessitates those policies outlining the ethical use of food security crops be developed and implemented, along with criteria on how agricultural products should be produced. It is crucial to legislate and put into practice laws that govern the moral use of precision farming, artificial intelligence (AI), and food security crops in commercial transactions within the agricultural industry.

These will also direct government initiatives to support smallholder farming in Southern Africa while also guiding the marketing of agricultural products to increase awareness in a way that is

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acceptable to society. Indigenous crops aimed at ensuring food security have a significant impact on the agricultural sector, helping it to produce more and create jobs, particularly when it comes to technical skills rather than just semi-skilled labor. In addition, policies will direct the hiring and placement of food security representatives for both domestic and foreign purchases and sales. There would be rapid rural development (RRD), particularly through smallholder farming, which would reduce poverty and ensure food security for rural residents. It is also advised that politicians respond quickly to the request for policy development to direct online transactions in all relevant ways, particularly considering the projects' popularity among Southern African smallholder farmers. Furthermore, it is advised that the government organize events and initiatives to increase public awareness and encourage the adoption of food security measures. The business climate needs to be addressed to guarantee the success and progress of smallholder farmers in Southern Africa. Future studies can focus on how social and cultural factors affect farmers' acceptance of food security crops and how youth extension programs can use implementation to identify solutions for many of the obstacles to the crops' adoption.

9. Limitations of the Study

Research with favorable results is more likely to be published, the review could be susceptible to publication bias. By limiting the review to English-language publications and studies finished between 2021 and the present, relevant material published prior to 2010 may have been missed. Furthermore, the review study mostly looked at literature on SA as a geographical region rather than concentrating too much on each of the 16 countries that comprise the region. As a result, research on smallholder farmers' adoption of food security programs from other SA nations would have been overlooked.

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