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REVIEW

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Are sub-Saharan African national food and agriculture policies nutrition-sensitive? A case study of Ethiopia, Ghana, Malawi, Nigeria, and South Africa

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Abstract

Background: In sub-Saharan Africa (SSA), malnutrition coupled with rising rates of undernutrition and the burden of overweight/obesity remains one of the most significant public health challenges facing the region. Nutrition-sensitive agriculture can play an important role in reducing malnutrition by addressing the underlying causes of nutrition outcomes. Therefore, we aim to assess the nutrition-sensitivity of food and agriculture policies in SSA and to provide recommendations for identified policy challenges in implementing nutrition-sensitive agriculture initiatives.

Methods: We assessed past and current national policies relevant to agriculture and nutrition from Ethiopia, Ghana, Malawi, Nigeria, and South Africa. Thirty policies and strategies were identified and reviewed after a literature scan that included journal articles, reports, and policy documents on food and agriculture. The policies and strategies were reviewed against FAO's Key Recommendations for Improving Nutrition Through Agriculture and Food Systems guidelines.

Results: Through the review of 30 policy documents, we found that the link between agriculture and nutrition remains weak, particularly in agriculture policies. The review of the policies highlighted insufficient attention to nutrition and the production of micronutrient-rich foods, lack of strategies to increase farmer market access, and weak multi-sectoral collaboration and capacity building.

Conclusion: Nutrition-sensitive agriculture has received scant attention in previous agricultural and food policies in SSA that were riddled with implementation issues, lack of capacity, and ineffective methods for multi-sector collaboration. Recognition of these challenges are leading countries to revise and create new policies that prioritize nutrition-sensitive agriculture as a key driver in overcoming malnutrition.

Keywords: Africa, Nutrition, Policy, Malawi, Nigeria, Ethiopia, Ghana, South Africa

Introduction

About 224 million of the 673 million of those undernourished reside in sub-Saharan Africa (SSA), comprising about one-third of the global total [1]. According to FAO [2], an estimated 239 million people in SSA were malnourished at a prevalence rate of 22.8%. Simultaneously, malnutrition in the form of overnutrition is also on the rise in the region, with 9.2% of the adult population being

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obese (Table 1). The number of overweight children in SSA increased from 6.6 million to 9.7 million [3]. Obesity among adolescence doubled to 2.1% in boys and 3.5% in girls and overweight/obesity among adults increased from 28% in 2000 to 42% in 2016 [4]. Several factors such as food insecurity, shift to Western diets, infectious diseases, prolonged drought, floods, resource conflict are partly responsible for the double burden of undernutrition and obesity [2, 5, 6]. The nutrition transition which refers to the shifts in dietary patterns and physical activity that are associated with changes in economic and social development are also attributed to the rise of obesity [7–9].

Food policy addresses the food system of a country which encompasses a wide range of topics including food production, processing, distribution, consumption, and demand; structural influences of the food supply; food production and consumption in light of health and environment [10]. It also involves implementing research on food quality; establishing governance and lobbies that control food policies, and assessing the impact of the food system on society [11]. On the other hand, agriculture policies include policy instruments related to the domestic farm sector, trade, food pricing, and ensuring food safety [12]. Food and agriculture policies have the potential to influence dietary behaviors through factors such as food prices, transportation, pricing, etc. [13]. Specifically, food and agriculture policies are important in shaping optimal nutrition outcomes and local food environments by manipulating various elements of the food system including market and trade systems, consumer purchasing power, agricultural production, and food transformation and consumer demand [14, 15]. In SSA, the impact of food and agriculture policies on nutrition outcomes is exemplified through continued focus of policies on the production of staple crops such as maize which has limiting effects on improving diet-related chronic diseases [16, 17]. This calls for increased attention to promoting

nutritionally rich foods and dietary diversity in food and agriculture policies, however approaches to achieve this are complex [18].

The impacts of agriculture on health and nutrition vary by regions and countries and can include improvements to food availability and access, food security, dietary quality and diversity, income, and women's empowerment [19–21]. Nutrition-sensitive agriculture is a food-based approach to agricultural development that emphasizes nutritionally rich foods, dietary diversity, and food fortification in overcoming nutrition-related diseases. Interest in nutrition-sensitive agriculture over the past decade has resulted in the development of several conceptual frameworks [22–27]. A framework that emerged from the Tackling the Agriculture–Nutrition Disconnect in India (TANDI) initiative identifies pathways linking agriculture and nutrition [24]. The pathway describes agriculture as a source of food, agriculture as a source of income for food expenditure, agriculture policy and the effects of agriculture production on food prices, agriculture as a source of income for nonfood expenditure (i.e., healthcare), effects of women's employment in agriculture on household decision-making, childcare practices and own nutritional and health status [24]. In addition to these frameworks, several nutrition-sensitive agriculture interventions have been implemented in SSA with varying levels of success. For example, biofortification programs in Mozambique of orange sweet potatoes was found to be successful in increasing the effects vitamin A intake among children [28]. In addition, evidence of a nutrition and gender sensitive agriculture intervention in Zambia which focused on homestead food production of nutrient-rich food had positive effects on some aspects of agricultural diversity and women's empowerment (i.e., social capital, increased financial and agricultural decision-making power) [29]. However, the intervention had limited effects on child and household dietary diversity.

Due to the complex nature of the nutrition transition, harnessing the potential of existing and new agriculture and food policies can be critical in staving off the nutrition transition problem. Agriculture and food policies developed and implemented within an enabling environment and that contain explicit nutrition goals, prioritize the production and marketing of nutritious foods, and emphasize multi-sectoral collaboration can have far-reaching effects on malnutrition. Therefore, the purpose of this paper is to review national food and agriculture policies and strategies of Ethiopia, Ghana, Malawi, Nigeria, and South Africa to determine if the policies and strategies are nutrition-sensitive. The review will shed light on policy challenges and will provide recommendations for countries to implement effective nutrition-sensitive agriculture initiatives. The current review will expand on the findings of similar studies

Table 1 Adult obesity in subregions of Africa, 2012 and 2016

	Adult obesity (%)	
	2012	2016
World	11.8	13.1
Africa	11.5	12.8
Northern Africa	23.0	25.2
Sub-Saharan Africa	8.0	9.2
Eastern Africa	5.3	6.4
Middle Africa	6.7	7.9
Southern Africa	25.0	27.1
Western Africa	7.4	8.90

Data from FAO, IFAD, UNICEF, WFP, and WHO (2020)

[15, 30, 31] by reviewing past and more recently developed food and agriculture policies that were not included in the previous studies.

Methods

Through a case-study approach, we assessed past and current national policies relevant to agriculture and nutrition in Ethiopia, Ghana, Malawi, Nigeria, and South Africa to understand the challenges and opportunities in improving nutrition outcomes through food and agricultural policies. These countries were selected as they have a relatively high GDP, the variety of SSA regions they represent, have stable governance situations, their relatively larger populations sizes (such as Ethiopia and Nigeria), and the experience of the authors in these countries. A review of the literature was conducted that included journal articles, reports, and policy documents related to agriculture and nutrition. Specifically, national food and agriculture policies and strategies were searched for using the following online resources: websites of national ministries of health, food and/or agriculture, Google Scholar, and WHO Global Database on the Implementation of Nutrition Action. The keywords that were used in the search included food, nutrition, agriculture and national strategy or policy as well as the country names. A total of 30 policies and strategies were identified (7 from Nigeria, 7 from Ethiopia, 6 from South Africa, 6 from Malawi, and 4 from Ghana). Policies and strategies available from 1980 and onwards were included. An additional file presents a historical overview of national policies related to agriculture and nutrition in SSA (see Additional file 1). The nutrition-sensitivity of the policies and strategies were evaluated against the Food and Agriculture Organization's (FAO) 10 Key Recommendations for Improving Nutrition Through Agriculture and Food Systems [32]. The 10 key recommendations include: (1) incorporate explicit nutrition objectives and indicators; (2) assess the context; (3) target the vulnerable and improve equity; (4) collaborate and coordinate with other sectors; (5) maintain or improve the natural resource base; (6) empower women; (7) facilitate product diversification; (8) improve processing, storage and preservation; (9) expand markets and market access; and (10) incorporate nutrition promotion and education. Each policy/strategy was qualitatively reviewed to determine if there was explicit mention of goals/objectives/activities related to the FAO key recommendations.

Results

Review of national food and agriculture policies in sub-Saharan Africa

Ethiopia

Ethiopia began transforming the agricultural sector in the mid-1990s after creating a development strategy focusing

on agriculture and national food security called the Agricultural Development-Led Industrialization (ADLI) (Table 2). Food insecurity was prevalent during this time due to the occurrence of several large scale famines and droughts which affected the nutritional status particularly among vulnerable populations, in which 41.9% of children were underweight in 1992 [33]. During this time policies were drawn from the Green Revolution in Asia which promoted agricultural intensification and commercialization to address decreasing food production and growing food insecurity [34, 35]. Although the large focus of the ALDI was on increasing food self-sufficiency as a strategy to achieving food security, the policy contained nutrition-sensitive aims related to the promotion of product diversification among smallholder farmers. The development of the ADLI was followed by the release of The Food Security Strategy of 1996 and the Food Security Program (FSP). The latter program also focused on crop diversification and improved farmer integration markets, as well as, improving the transportation of food. The FSP was embedded in the national poverty reduction strategy and contained the Productive Safety Net Program (PSNP), which similarly to the ADLI, targeted small-scale farmers. Although crop production intensified during this period (i.e., cereal production increased from 6.1 million metric tons in 1990 to 10.1 million metric tons [36]), food insecurity and malnutrition remained prevalent, in which 32.9% of children were underweight in 2005 [37].

The National Nutrition Strategy (NNS) put nutrition on the national agenda by being the first nutrition policy document approved by the Council of Ministers of the Ethiopian government. The NNS was a key nutrition policy document developed under the motivation to prevent malnutrition and improve population nutritional status [38]. The National Nutrition Programme (NNP) was developed to implement the NNS. The NNP was successful in introducing nutrition in the policy landscape and since then nutritional-related indicators such as stunting have been implemented into policies including The Growth and Transformation Plan. Modest improvements in nutrition trends were seen during the time the NNS and NNP were in place, in which the percentage of children underweight decreased to 28.7% in 2011 [39]. The NNP was revised in 2013 and subsequently in 2016, with the latter emphasizing the importance of leveraging nutrition in multiple sectors including agriculture. The Ministry of Agriculture was given the mandate to mainstream nutrition in the agriculture sector which involved strengthening nutrition linkages with agricultural subsectors, conduct nutrition training, and support nutrition linkages in agricultural programs and policies. This was further emphasized in The Nutrition Sensitive

Table 2 Selected national food and agriculture policies in Ethiopia

Policy	Year	Goal (s)	Key considerations to FAO recommendations	Policy challenges
Agricultural Development-Led Industrialization (ADLI)	1993	To strengthen the linkages between agriculture and industry by increasing the productivity of small-scale farmers, expanding large scale private commercial farming, reconstructing the manufacturing sector to leverage the country's human and natural resources	Policy was drawn from the Green Revolution in Asia to address food security Targeted smallholder farmers to promote product diversification Aimed to effectively integrate farmers in domestic and external markets	Minimal attention to improving nutrition
The National Nutrition Strategy (NNS)	2008	To ensure that all Ethiopians secure adequate nutritional status in a sustainable manner, which is an essential requirement for a healthy and productive life	Focused on reducing malnutrition among the most vulnerable groups Includes components to help promote healthy diets and lifestyles Explicit attention to multi-sectoral coordination	Acknowledges the importance of establishing a multi-sectoral coordination mechanism but did not include the role/responsibilities of each sector
Agriculture Policy and Investment Framework (PIF)	2010	To contribute to Ethiopia's achievement of middle-income status by 2020	Reduction in the prevalence of child malnutrition is an expected outcome Contains a focus on improving land and water resources and maintaining biodiversity Includes improved access to agricultural inputs and market access	Does not incorporate explicit nutrition objectives and rather has a focus on improving food security Includes diversification of production into higher value crop to promote agricultural commercialization than to improve nutrition outcomes
The National Nutrition Programme I (NNPI)	2008–2013	To integrate and coordinate nutrition-specific interventions and nutrition-sensitive interventions to address challenges of growth, development, and malnutrition	Successful in introducing nutrition as an area of focus in the policy landscape (i.e., nutritional-related indicators such as stunting were included in policies and plans such as The Growth and Transformation Plan)	Weak linkages across relevant sectors and partners Lack of sustainable micronutrient interventions Limited focus on women-specific interventions
The National Nutrition Programme (Revised)	2013–2015	Strategic Objective 1: Improve the nutritional status of women and adolescents Strategic Objective 2: Improve the nutritional status of infants, young children, and children under 5 years Strategic Objective 3: Improve the nutrition service delivery for communicable and non-communicable related diseases Strategic objective 4: Strengthen implementation of nutrition-sensitive interventions Strategic objective 5: Improve multi-sectoral coordination and capacity	Multisectoral coordination was established through the National Nutrition Coordination Body and the National Nutrition Technical Committee Explicit linkages to the agriculture sector The Ministry of Agriculture was given the mandate to mainstream nutrition in the agriculture sector which involved strengthening nutrition linkages with agricultural subsectors, conduct nutrition training, and support nutrition linkages in agricultural programs and policies Contains appropriate nutritional targets	Multisectoral coordination was not effective due to inadequate commitment and lack of strong governance structures

Table 2 (continued)

Policy	Year	Goal (s)	Key considerations to FAO recommendations	Policy challenges
The National Nutrition Programme II	2016–2020	To provide a framework for coordinated implementation of nutrition interventions in order to end hunger by 2030	<p>Strong multi-sectoral coordination and nutrition governance focus</p> <p>Contains objectives to improve nutrition status of vulnerable groups</p> <p>Focus on promoting women's empowerment and gender equality</p> <p>Includes initiatives related to strengthening of nutrition education</p> <p>Promotes production, processing, and preservation of diverse and nutritious foods</p> <p>Contains initiatives to strengthen the implementation of nutrition-sensitive interventions in the agricultural sector such as increasing access to fruit and vegetables</p> <p>Focuses on strengthening market linkages for nutritious foods</p>	<p>Challenges in multi-sector coordination weakened policy implementation (PDF NNPPII PROGRESS)</p>
Nutrition Sensitive Agriculture Strategy 2016–2020	2016	To contribute to the NNP II goal of improving nutritional status of children and women by increasing the quantity and quality of food available, accessible and affordable and promoting utilization of diverse, nutritious and safe foods for all Ethiopians at all times	<p>Contains commitment to leverage nutrition into agriculture policies</p> <p>Includes strategies to ensure availability and access to diverse, nutritious foods</p> <p>Aims to improve multi-sector coordination</p> <p>Contains commitment to improving post-harvest processing</p> <p>Focus on improving women's empowerment</p>	<p>The roles and responsibilities of sectors in improving nutrition is missing</p> <p>Unclear how capacity of sectors will be strengthened to address nutrition</p>

Agriculture Strategy which recognized non-linear agriculture–nutrition pathways and vowed to act on different routes including food production and productivity, agricultural income, and women’s empowerment [40].

Ghana

The government of Ghana implemented several policies to reduce poverty, ensure food security and improve nutrition and health (Table 3). The government of Ghana introduced Accelerated Agricultural Growth and Development Strategy (AAGDS) I & II in the mid-1990s as policies to forge linkages in the value chain. Food and industrial crop production to increase economic growth rather than to improve nutrition outcomes were the focus of the AAGDS I and II. AAGDS II policy was later replaced by the first Food and Agriculture Sector Development Policy (FASDEP I) in 2002 aimed at modernizing the agriculture sector in Ghana [41, 42]. After implementing FASDEP I for four years, it was revised to FASDEP II to address the limitations of FASDEP I that included improper targeting of poor smallholder farmers who had limited access to credit and technology, proper infrastructure, and markets [42]. Although the FASDEP II lacks explicit nutrition-related goals/objectives, the policy does include a focus on improving food security through the production of at most 5 staple crops. Additionally, the government introduced the Regenerative Health and Nutritional Programme (RHNP) to address diet-related diseases especially non-communicable chronic diseases (NCDs) in 2007. The program emphasized healthy eating and exercise and emphasized collaboration with key partners including the Ministry of Food and Agriculture. However, most of the foods recommended by the program were not readily available to poor households who face nutritional deficiency [43]. In 2013, the government introduced the National Nutrition Policy (NNP) aimed at developing an evidence-based national intervention to address nutrient deficiency [44]. The NNP recognizes linkages between nutrition and agriculture and proposed a multi-sectoral technical committee on nutrition to bring together ministries among others to coordinate policy issues and directions for nutrition.

According to a recent report, the implementation of the policies has decreased hunger by 75% since the 1990s and, the number of malnourished people has decreased from 7 to 1 million in 2015 [45, 46]. Ghana is one of the few countries in Africa to achieve the Millennium Development Goal 1 (eradicate extreme poverty and hunger) by reducing poverty by half [42]. However, the problem of overnutrition has emerged resulting in high cases of overweight/obesity. According to the 2014 demographic and health survey, 40% of women in

Ghana were overweight/obese [45] and the rate is even higher (49%) in urban areas [47]. Even though food and nutritional security have significantly improved over the years, micronutrient deficiency is high especially in iron deficiency among girls, women, and children as well as increasing stunting, overweight, and obesity in Ghana [45]. Therefore, addressing nutritional deficiency requires a concerted effort by the government to introduce policies that will not only address food insecurity but also address nutritional insecurity.

Malawi

Despite significant crop production in the agriculture sector, Malawi continued to experience high levels of malnutrition and food insecurity in the 1970s and 1980s in which about 55% of children were malnourished [48]. To address these challenges, the government adopted the first Food Security and Nutrition Policy in 1990 (Table 4). The policy’s limited focus on nutrition led to the development of several subsequent nutrition policies. This includes the Food and Nutrition Policy which was split into two separate policy documents: Food Security Policy and National Nutrition Policy. The Food Security Policy was adopted in 2006 and included multiple strategies to improve food availability, access, and stability. However, nutritional issues remained prevalent before and after these policies were implemented in which stunting in children mildly decreased from 52.5% in 2004 to 47.1% in 2010 [49, 50]. The subsequently developed nutrition policy, the National Nutrition Policy and Strategic Plan, contained more nutrition-related objectives and places greater attention on the agriculture sector in promoting dietary diversity yet lacks strategies to increase market access for the most vulnerable. Although the prevalence of malnutrition remained high after the implementation of these policies, Malawi experienced significant progress in improving nutritional status in which stunting in children decreased from 52.5% in 2004 to 37.1% in 2015 [49, 51]. The National Multi-Sector Nutrition Policy 2018–2022 was developed following the review of the National Nutrition Policy and Strategic Plan [52]. This policy uses a multi-sectoral and evidence-based approach in improving nutrition outcomes and therefore places a high commitment to adopting nutrition-sensitive interventions. Since independence, the Malawi government has not released a comprehensive agricultural policy until recently in 2016 when the National Agricultural Policy was adopted. The National Agricultural Policy recognizes food and nutrition security as an area of high concern and states the need for diversification by prioritizing the commercialization of smallholder farmers [53]. Previously, agricultural strategies have been embedded within key development strategies such as The Malawi Growth

Table 3 Selected national food and agricultural policies in Ghana

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations	Policy challenges
Food and Agriculture Sector Development Policy II (FASDPE II)	2007	Food security and emergency preparedness Improved growth in incomes Increased competitiveness and enhanced integration into domestic and international markets Sustainable management of land and environment Science and Technology Applied in food and agriculture development Improved Institutional Coordination Security and emergency	Included a strategy for improving food security through enhancing nutrition through coordination of prog Includes strategies to improve infrastructure and access to markets	Product diversification was mentioned with intentions to increase market competitiveness rather than to improve nutrition outcomes
Regenerative Health and Nutrition Programme (RHNP)	2007	Promote healthy lifestyles including eating more fruits and vegetables, reducing consumption of fatty foods and alcohol, and increasing physical activities	Contains priority interventions to improve nutrition outcomes Focus on partnership building with various ministries including the Ministry of Food and Agriculture to promote activities such as introducing new food varieties to communities and farmers	Focus is on individual-level strategies for behavior and attitude change Minimal attention on the role of the agriculture sector in increasing food and vegetable consumption
Medium Term Agricultural Sector Investment Plan (METSASID II)	2015	To accelerate the modernization of agriculture and ensure effective natural resources management and environmental governance regime Sustainable Natural Resource Management will transform the agricultural sector to increase productivity and output, create jobs, increase incomes, and ensure food security over the medium term	Agricultural competitiveness and integration into the domestic and international market Crop development and diversification Contains nutrition-sensitive agriculture as a sub-program to mainstream nutrition into agricultural policies Includes focus to enhance nutrition education to promote consumption of micronutrient-rich food	Lacks initiatives to improve women's empowerment Roles of collaborating partners are not made clear
National Nutrition Policy (NNP)	2013	The goal of the NNP is to ensure optimal nutrition for all people living in Ghana throughout their lifecycle To increase coverage of high-impact nutrition-specific interventions that ensure optimal nutrition of Ghanaians throughout their lifecycle, with special reference to maternal health and child survival To ensure high coverage of nutrition-sensitive interventions to address the underlying causes of malnutrition To reposition nutrition as a priority multi-sectoral development issue in Ghana	Contains nutrition-related objectives and focus areas including the prevention of nutrition disorders in vulnerable groups Focus on effective intersectoral partnership and coordination to address nutrition issues Focus on integrating nutrition into agriculture programs and increasing diversified food crops Promotion of practices to ensure availability, access, diversity and proper storage of foods	Mentions the need for efforts to improve women's social status in all aspects of nutrition, but lacks details on how this will be achieved Lacks initiative to improve nutrition education among community members

Table 4 Selected national food and agriculture policies in Malawi

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations	Policy challenges
Food Security and Nutrition Policy	1990	To improve food security through increased agricultural production, improved employment, capacity development, and income transfers to the very poor	Focus is on food security rather than on improving nutrition	Did not give adequate attention to nutrition Did not include operationalization plan for nutrition components and budget for nutrition initiatives Did not provide capacity for implementation
Food Security Policy	2006	To significantly improve food security of the population. The goal implies increasing agricultural productivity as well as diversity and sustainable agricultural growth and development	Promoting access to nutritious foods was included Women's empowerment and equitable distribution of income through improvement of their knowledge of market functions was mentioned Contains multi-sector food and nutrition security joint task force	Included strategies to improve food availability, access and stability but lack strategies on food utilization Did not include strategies to increase production of nutrient-rich foods, to retain food processing to retain nutrients, and increasing market access for smallholder farmers Lacked nutrition objectives and indicators Lacked implementation approaches
The National Nutrition Policy	2007	To provide policy and technical guidance to policy makers and nutrition stakeholders in designing, development and implementation of nutrition programs, projects and interventions that will effectively contribute to improved nutrition status of all Malawians and the country's economic prosperity	Vowed to incorporate nutrition in all sectoral policies for a multi-sector approach and increased budget allocation for nutrition intervention implementation Addressed key determinants of nutritional status including food-based approaches (i.e., dietary diversification) Highlights roles of the agriculture sector: nutrition education provision, promotion of food processing and storage techniques	Lack of capacity and trained personnel limited policy implementation
The National Nutrition Policy and Strategic Plan	2009	To have a well-nourished Malawi nation with sound human resource that effectively contributes to the economic growth and prosperity of the country	Includes nutrition indicators and commitment to increasing nutrient-rich food production Establishment of multi-sectoral coordination is a priority area Promotes diet diversification and nutrition education and awareness	Does not contain strategies to improve food processing to retain nutrients Does not contain strategies to increase market access for smallholder farmers Failed to recognize women's constraints in accessing nutritious foods
National Agricultural Policy	2016	To achieve sustainable agricultural transformation that will result in significant growth of the agricultural sector, expanding incomes for farm households, improved food and nutrition security for all Malawians, and increased agricultural exports	Contains nutrition-related objectives and explicit linkages to the agriculture sector and promotes multi-sectoral approaches Promotes production and utilization of diverse nutritious foods The Ministry of Agriculture was given the mandate to mainstream nutrition in the agriculture sector which involved strengthening nutrition linkages with agricultural subsectors, conduct nutrition training, and support nutrition linkages in agricultural programs and policies Contains a focus on empowering women and targeting vulnerable groups	No quantitative objectives are linked to the priority area Food and Nutrition Security

Table 4 (continued)

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations	Policy challenges
The National Multi-Sector Nutrition Policy (2018–2022)	2018	A well-nourished Malawian population that effectively contributes to the economic growth and prosperity of the country	<p>Prevention and management of overweight and nutrition-related NCDs is a priority area</p> <p>Aims to promote nutrition-sensitive interventions in core sectors</p> <p>Promotes gender equality and improvement to women's decision-making power for access to nutrition</p> <p>Promotes nutrition education for positive behavior change</p> <p>Focus on partnerships in the production and processing of nutritious foods</p> <p>The Ministry of Agriculture, Irrigation and Water Development is considered the responsible body for food and nutrition security and will support the production of diverse, nutritious crops</p>	<p>Lacks attention on increasing market access for smallholder farmers</p> <p>Does not contain a focus on improving natural resources (i.e., water, soil) for agricultural food production</p>

and Development Strategies. The Malawi Growth and Development Strategies have undergone multiple revisions and its third revision is currently in place until 2022.

Nigeria

A common trend among the early agriculture and nutrition policies in Nigeria was the promotion of food security in the absence of nutrition-specific priorities. This was observed in both The Agricultural Policy for Nigeria (1998) and The New Nigerian Agricultural Policy which was subsequently adopted in 2001 (Table 5). Ashaolu et al. [54] found that though food security was particularly pronounced in The New Nigerian Agricultural Policy, not all dimensions of food security were adequately addressed. In addition to The New Nigerian Agricultural Policy, a nutrition policy was developed in 2001 called the National Policy on Food and Nutrition in Nigeria and included a commitment to address major food and nutrition challenges using a multi-sectoral approach. However, the role of the agriculture sector in improving food security and nutrition was limited in scope and was only emphasized in strategies to increase food access [55]. As a result of the policy's limitations, the policy had little to no effect in improving population-level nutritional outcomes [56]. As such stunting trends remained fairly static before and after the implementation of these policies in which stunting in children modestly decreased from 48.7% in 1990 to 42.4% in 2003 [57, 58]. This led to the revision of the National Policy on Food and Nutrition in 2016, which similarly took a multi-sector approach to address emerging issues such as diet-related NCDs, and contained nutrition-sensitive agricultural strategies [56, 59]. Food and nutritional security were recognized in the Agriculture Transformation Agenda (ATA) and were to be achieved through production specialization of key commodities. However, an econometric analysis by Ecker et al. [60] found that farm production diversity increased between 2011 and 2016 despite the ATA's vision of production specialization. Following the ATA, three major policies were developed in 2016 including the Agriculture Promotion Policy, Agriculture Sector Food Security and Nutrition Strategy, and the previously mentioned National Policy on Food and Nutrition. These policies signified steps forward in recognizing the importance of the agriculture sector's role in improving the nutrition situation in Nigeria. However, poor implementation and lack of funding have constrained Nigeria from experiencing these benefits [61].

South Africa

The White Paper on Agriculture (1995) was a policy document developed by the Ministry of Agriculture and

contained a vision for South African agriculture that focused on creating a strong economy from a market-directed farming sector (Table 6). The policy signaled a priority shift from food self-sufficiency to food security. However, the vision to improve food security was implicitly recognized and was nested within agricultural sector strategies of increasing food production. A similar approach was seen in the 1998 Discussion Document on Agricultural Policy in South Africa and policies that were later developed including the 2012 Integrated Growth and Development Plan. Similarly, the policies were limited in addressing nutrition and failed to include nutrition-related objectives. The Integrated Food Strategy of South Africa (2002) recognized the potential for agriculture to contribute to better nutrition through agricultural efforts to increase food production, food access, and income generation [62]. The implementation of these policies resulted in minimal change in nutritional trends. For example, stunting rates in children remained high in which a modest decrease from 28.7% to 24.9% was observed from 1994 to 2008 [63]. A review of the Integrated Food Strategy led to the development of the National Policy on Food and Nutrition Security in 2014, which contained a commitment to ensure better coordination between sectors and emphasized the agricultural sector to increase food production. The Agricultural Policy Action Plan was adopted in 2015 and focused on facilitating several agricultural value-chains to meet the objectives of development plans such as improving food security, job creation, production value, growth potential, and trade balance [64]. Although nutrition is receiving greater attention in more recent policies, the ways to achieve improved nutritional outcomes are often missing, for example strategies that promote agricultural diversification, food processing to retain nutrient value, and food storage of nutrient-rich foods [30].

Policy challenges

Limited attention on micronutrient-rich food production

The agricultural policies reviewed rely heavily on increasing agricultural production of staple commodities such as cereal crops and lack attention to opportunities to address dietary diversity and micronutrient malnutrition. For example, Ghana's FASDPE II, Ethiopia's Agriculture Policy and Investment Framework (PIF), and South Africa's Discussion Document on Agricultural Policy all seek to diversify crop production, but with a focus on boosting agricultural commercialization rather than enhancing nutrition. The overemphasis of staple crop production such as maize is also seen in policies and programs in Malawi [65]. This is highlighted by the Farm Income Subsidy Program (FISP) under Malawi's Growth and Development Strategy, which subsidizes fertilizers

Table 5 Selected national food and agriculture policies in Nigeria

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations	Policy challenges
Agricultural Policy for Nigeria	1988	To achieve self-sufficiency in food and agricultural raw materials	Contained objective to attain food security, but lacked focus on improving nutrition	Did not contain nutrition-related objectives
The New Nigerian Agricultural Policy	2001	To achieve self-sufficiency in basic food supply and the attainment of food security, increased production of export crops and agricultural raw materials for industries through improved production and processing technologies; rational utilization and improved protection of agricultural land resources for the sustainability of agricultural production; generation of gainful employment for Nigerians; and improvement in the quality of life of rural dwellers	Contained explicit objective of attaining food security, but lacked nutrition-related objectives	Lacks nutrition-specific objectives and strategies to improve nutrition outcomes Policy had a positive impact on food self-sufficiency but was ineffective in addressing food stability [54]
National Policy on Food and Nutrition	2001	To improve the nutritional status of all Nigerians, with particular emphasis on the most vulnerable groups, i.e., children, women and the elderly	Contained targets to address food and nutrition problems Promotes proper land and soil conservation practices Aims to establish channels for distribution of inputs for vulnerable farmers Aims to increase women's access and control over resources for agricultural production Encourages integrated farming to increase food diversity Aims to improve food harvesting, processing and preservation techniques	Recognized the agriculture sector in policy strategies but did not include a clear institutional framework for engaging the agricultural sector Lacked strong coordination and monitoring system for nutritional strategies and policy implementation Policy had little to no effect in improving population-level nutritional outcomes [56]
Agricultural Transformation Agenda 2011–2015	2011	To achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment, and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers	Focus on improving market access for small-holder farmers Identifies minimal opportunities for women's empowerment	Does not contain nutrition-related objectives Attention on partnership building is to drive markets rather than to improve nutrition Focus of the agricultural transformation is to increase jobs, wealth and food security, rather than nutrition Focus was on production specialization rather than diversification, however an analysis found that between 2011 and 2016 farmers did not participate in the policy's vision of specialized commercial production [60]
Agriculture Promotion Policy 2016–2020	2016	To build an agribusiness economy capable of delivering sustained prosperity by meeting domestic food security goals, generating exports, and supporting sustainable income and job growth	Contains the priority of food, consumption, and nutrition security Aims to make nutritious foods available at the local level (i.e., school feeding programs), food fortification through breeding and post-harvest handling Aims to raise awareness about nutritious foods	Nutrition-sensitive agriculture is recognized as a policy priority but does not contain indicators/targets for malnutrition (i.e., stunting, wasting, underweight, etc.) Minimal attention to increasing market access to vulnerable groups

Table 5 (continued)

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations	Policy challenges
Agricultural Sector Food Security and Nutrition Strategy 2016–2020	2016	To improve the food and nutrition security of all Nigerians while empowering women and promoting resilience of the most vulnerable through sustainable agricultural livelihoods	<p>Contains nutrition-related objectives</p> <p>Strategic priorities include nutrition-sensitive agriculture strategies (i.e., promotion of nutrition-sensitive value chains)</p> <p>Focus on protecting vulnerable groups through social protection nets</p> <p>Aims to improve food security through production, processing, storage, and preservation and through expanding market access</p> <p>Focus on women's empowerment</p> <p>Targets for hunger, stunting, anaemia, birth weight, obesity, childhood overweight, dietary diversity, food consumption, and agricultural budget allocation to nutrition included</p>	Importance is placed on multi-sectoral coordination, however roles of partners are unclear
National Policy on Food And Nutrition	2016	To attain optimal nutritional status for all Nigerians, with particular emphasis on the most vulnerable groups such as children, adolescents, women, elderly, and groups with special nutritional needs	<p>Contains nutrition-related objectives and targets</p> <p>Strategies include supporting integrated farming for increased diversity and income generation, promotion of value chain of crops and horticulture, biofortification, introduce harvesting, processing, and preservation of foods</p> <p>Promotes access of smallholder farmers to technologies for improved harvesting and access to markets</p> <p>Contains objective to improve nutrition education</p> <p>Strong multi-sectoral approach</p>	<p>Opportunities to support women's empowerment is limited</p> <p>Recognizes the multi-sectoral nature of nutrition, however lacks multi-sectoral coordination mechanisms</p>

Table 6 Selected national food and agriculture policies in South Africa

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations
The White Paper on Agriculture	1995	<p>Develop a new order of economically viable, market-directed commercial farmers, with the family farm as the basis</p> <p>The broadening of access to agriculture via land reform should be enhanced by adequate agricultural policy instruments and supported by means of the provision of appropriate services</p> <p>Financial systems should focus on the resource-poor and beginner farmers, enabling them to purchase land and agricultural inputs</p> <p>Trade-in and the marketing of agricultural products should reflect market tendencies</p> <p>Agricultural production should be based on the sustainable use of the natural agricultural and water resources</p> <p>Developing agriculture's important role in the regional development of Southern Africa and other countries</p>	<p>The policy recognizes the importance of addressing national and household food security, but lacks nutrition-related objectives</p> <p>Focus on improving farmer access to land, markets, and services for agricultural production</p> <p>Explicit nutrition objectives are missing from the policy document</p>
Discussion Document on Agricultural Policy in South Africa	1998	<p>To build an efficient and internationally competitive agricultural sector</p> <p>To support the emergence of a more diverse structure of production with a large increase in the numbers of successful smallholder farming enterprises</p> <p>To conserve our agricultural natural resources and put in place policies and institutions for sustainable resource use</p>	<p>Implicit focus on food security and increasing food production</p> <p>No attention on the nutritional quality of foods being produced</p> <p>The aim of agricultural production is to increase market competitiveness, rather than on improving nutrition</p>
Integrated Food Strategy of South Africa	2002	<p>To attain physical, social, and economic access to sufficient, safe, and nutritious food by all South African at all times to meet their dietary and food preferences for an active and healthy life</p> <p>To eradicate hunger, malnutrition, and food insecurity over 2015</p>	<p>Contains nutrition-related objectives</p> <p>Includes mention of promoting nutrition education</p> <p>Includes multi-sectoral partnerships to improve nutrition</p> <p>Promotes market access among smallholder farmers</p> <p>Weak institutional framework led to ineffective implementation [71, 72]</p> <p>Poor coordination led to an overemphasis on agricultural production [70]</p> <p>Attention to increasing nutrient-rich food production, and strategies to improve post-harvesting, storage, and processing is missing</p> <p>Lacks initiatives to improve women's empowerment</p>
Integrated Growth and Development Plan	2012	<p>To achieve the transformation and restructuring of the agriculture, forestry, and fisheries sectors, which are currently dominated by a small number of large companies, and to ensure that constraints experienced in the areas of input supply, production, and marketing are addressed cost-effectively and in a timely manner</p>	<p>Aims to improve smallholder farmer market access and secondary cooperatives (i.e., marketing)</p> <p>Focus on maintaining biodiversity</p> <p>Contains a focus on increasing equity in terms of market access, gender, information and support</p> <p>Does not include nutrition-related objectives and indicators</p> <p>Does not contain objectives related to production diversification</p>

Table 6 (continued)

Policy	Year	Goal(s)/objectives	Key considerations to FAO recommendations
National Policy on Food and Nutrition	2014	To ensure the availability, accessibility, and affordability of safe and nutritious food at national and household levels	<p>Focus on improving nutrition education to assist in monitoring nutrition indices, improving consumer literacy and assisting with better food management and meal planning</p> <p>Focus on improving market participation among smallholder farmers</p> <p>Increased investment in agriculture including increased provision of inputs and services for increased food production and more effective food storage</p> <p>Policy does not mention the promotion of diverse agricultural production for better nutrition outcomes</p> <p>Lacks attention on retention of nutrients in food processing, and improved storage strategies [30]</p>
Agricultural Policy Action Plan (2015–2019)	2014	Equitable growth and competitiveness Equity and transformation Environmental sustainability Governance	<p>Eleven interventions including several value chains were proposed to increase production, employment opportunities, exports, and improve smallholder farmer opportunities for income and market access</p> <p>Several transversal interventions were proposed including Fetsa Tiala which focuses on supporting the production of subsistence and smallholder and includes a focus on micronutrient content of crops</p> <p>Does not contain explicit nutrition objectives and initiatives to diversify food production</p> <p>Does not target vulnerable groups and lacks initiatives to improve women's empowerment</p>

and improved seeds mainly for maize production. The FISP was central to the growth of the agricultural sector but has been criticized as being inefficient and expensive taking up between 50 and 75% of Malawi's agriculture budget annually leaving little room for alternative interventions such as produce diversification [65]. In addition, the program has resulted in a market dominated by maize leaving farmers unable to profitably sell their produce and therefore limiting their ability to sustainably produce nutritious foods. Although the program contributed to increases in maize output and maize self-sufficiency, food insecurity has prevailed, and diets remain poorly diversified [66].

Lack of agriculture policies with nutrition priorities

The primary focus of the majority of agricultural policies is to increase agricultural production and productivity in an effort to bolster economic opportunities and increase the pace of poverty reduction. Thus, measurable nutritional-related objectives are often missing from these policies (i.e., Malawi's National Agricultural Policy) making it difficult to measure the progress and success of policy interventions. Other policies reviewed that lacked nutrition-related objectives includes Ethiopia's ADLI and PIF, as well as, the Agricultural Policy for Nigeria.

Food security was recognized as a key priority within the majority of agriculture policies with the implicit assumption that food security will lead to better nutritional outcomes. Although food security and nutrition are closely interrelated, the focus on food self-sufficiency is inadequate in guaranteeing optimal nutritional status and/or food security. This is seen in South Africa as the country is considered food self-sufficient, yet struggles with household food security, inequities in food access, and malnutrition [67]. Achieving food security goes beyond merely meeting food self-sufficiency and requires food to not only be physically available but also accessible and usable, as well as for these conditions to be stable over time. Yet, policies fail to simultaneously address every pillar of food security and are preoccupied with increasing the quantity of food at the expense of improving food quality.

The lack of nutrition goals and objectives within agriculture policies could be related to separate and countervailing silos across sectors that are embedded within a weak enabling environment. The Leveraging Agriculture for Nutrition in East Africa study highlighted the general lack of knowledge on how agriculture can contribute to nutrition beyond increasing productivity [68]. A similar multi-country study found that stakeholders in South Africa demonstrated a similar puzzlement highlighted by comments like: "why should agriculture be responsible for nutrition?" and "agriculture has become a business

and its main purpose is (and should remain) profitability and increased production" [15]. These perceptions translate into the lack of political will which can further constrain policy implementation.

Weak multi-sector collaboration to improve nutrition

A weak enabling environment to leverage agriculture to improve nutrition is partly due to the ineffective collaboration between sectors and stakeholders during policy planning, monitoring, and implementation. In all five countries, policy implementation of nutrition components was limited as sectors failed to ensure multi-sector collaboration. For example, Ethiopia's NNP included a Nutrition Coordination Body co-chaired by the Ministry of Agriculture, yet sectors failed to mainstream nutrition into their sectoral strategic plans [69]. Similarly, in The Integrated Food Strategy of South Africa 2002, multi-sector coordination was recognized yet unsuccessful as the Department of Agriculture carried out the majority of implementation [70–72]. This was also seen in Nigeria's National Policy on Food and Nutrition recognized the agriculture sector in policy strategies yet, did not have a clear institutional framework for engaging the sector.

Weak capacity for policy implementation

Inadequate capacity in the form of training/knowledge, financial constraints, and human resources are barriers to addressing nutrition through agriculture [68, 73]. These challenges are even seen in policies that incorporate nutrition objectives but may not be implemented effectively due to weak capacity. For example, the implementation of Ethiopia's National Nutrition Programme fell short as ministries lacked an effective organizational structure to integrate nutrition into their core activities, did not allocate a sector budget for nutrition plans, and lacked mechanisms for nutrition data triangulation [69]. Similarly, Nigeria's National Policy on Food and Nutrition lacked strong coordination and monitoring systems for policy implementation [56]. In addition, South Africa's Integrated Food Strategy of South Africa suffered from poor coordination and weak institutional framework which led to ineffective policy implementation. Even when evidence is available, it was found that policy makers lack the capacity to link, analyze and interpret data thereby limiting its translation into policy [68].

Lack of market access for smallholder farmers

Nutrition-sensitive agriculture can address issues related to access including limited market access for smallholder farmers. In the policies reviewed, limited attention was given to interventions to expand market access for smallholder farmers and on the barriers withholding farmers from integrating into markets. The commercialization

of agriculture was a long-standing goal in South Africa as stated in the White Paper of Agriculture published in 1995. The White Paper advocated for providing support services to allow farmers to move into commercial farming [74]. However, researchers have shown that commercialization may hamper smallholder farmer productivity if barriers to market participation are not appropriately addressed [75]. These barriers can include unavailability of credit, lack of institutional support, high transaction costs, lack of training, inadequate property rights, and poor market access [76]. Yet these constraints were given limited attention within the policies reviewed including Malawi's Food Security Policy and National Nutrition Policy and Strategic Plan. Even in policies that do include the priority of expanding market access for smallholder farmers such as Malawi's National Agriculture Policy 2016, improving market access to nutrient-rich foods was missing.

Discussion

A review of the agricultural policies in Ethiopia, Ghana, Malawi, Nigeria, South Africa uncovers several critical paths and policy recommendations to strengthen nutrition-sensitive agriculture and stave off nutrition transition. First, governments must support policies that promote the production and diversification of micronutrient-rich foods. Multiple studies have demonstrated a relationship between agricultural production and dietary diversity [73, 77–84]. Policymakers are beginning to recognize the need to move beyond the production of staple crops and integrate strategies to promote micronutrient-rich foods. For example, Ethiopia and Nigeria's nutrition-sensitive agricultural strategies [40, 85] have recognized the benefits of leveraging agriculture to increase the production of nutritious foods. Studies have demonstrated how, for instance, African Indigenous Leafy Vegetables (AILVs), tubers, and cereals such as sorghum and millet can address the nutritional needs of people [6, 43, 86, 87]. However, parents prefer to give their children bread and soda because of negative perception regarding African Indigenous Food Crops (AIFCs), which has little to do with nutrition [6]. AIFCs are associated with poverty and considered poor peoples' food. Consequently, many AIFCs are going extinct due to a lack of cultivation, consumption, and inadequate knowledge of preparation among the youth [6]. Hence, future policies should focus on promoting agricultural diversity to improve the food systems while simultaneously remediating the negative impacts of the nutritional transition.

Secondly, governments should provide strategies to strengthen value chains for nutritious foods. Growth in population, urbanization, and incomes are driving the food system transformation in SSA towards the

modernization of food production, processing, and distribution and increased value chain coordination [88]. Research has shown that agricultural value chains can be an essential mechanism in promoting the production and consumption of nutritious foods [89, 90]. However, few policies focus on improving nutrition through the performance of value chains, as agricultural policies in many African countries are still focused on industrializing food value chains and neglect micronutrient-rich vegetables and fruits [91]. For example, studies have suggested that scaling up pulse value chains in sub-Saharan Africa can positively affect nutritional and economic sustainability yet receive limited policy attention compared with staple cereal crops [92]. In addition, traditional cash crops (i.e., tea, tobacco, palm oil) destined for the international market have been a significant focus in agriculture policies. A policy shift from traditional cash crops to food crops as cash crops in the local market is needed. The rise in the urban population creates a new wave of consumers, therefore, policy focused on food value-chains can be beneficial. Policies must contain clear nutrition goals for value chains to produce nutritious foods. An enabling environment to develop value chains for nutrition can be encouraged through creating incentives for actors throughout the chain and provide services for farmers and businesses to overcome challenges along the supply chain [93].

Thirdly, governments must improve market access for smallholder farmers through effective strategies and policies to strengthen nutrition-sensitive agriculture. Physical and economic proximity to markets can increase incomes from selling farm produce and increased physical access and availability to foods with higher nutrient content and higher dietary diversity [94]. Studies have demonstrated a positive relationship between market access and household dietary diversity and nutrition [95–98]. These findings call for future policies to incorporate strategies to increase market access by improving the conditions for successful market participation. This includes infrastructure development to reduce travel times to markets and service delivery models specific to connected and remote farms [99]. In addition, there is a need for policies to address eliminating barriers for entry into markets. These policies include reducing transaction costs associated with poor rural infrastructure, increasing access to information and finance, capacity building for effective knowledge uptake, and increasing support for producer organizations to link farmers to food processing facilities and retailers [100, 101].

Finally, multi-sector collaboration must be strengthened as it fosters an enabling environment for successfully implementing nutrition-sensitive policies and programs. Multi-sector nutrition programs enable

stakeholders to address the multifaceted nature of nutrition challenges by integrating program design, implementation, and monitoring across sectors. Establishing nutrition as a key policy priority area in national policy documents is essential in enabling multi-sector collaboration and improved nutrition outcomes [102]. Although recent policy documents have recognized the role agriculture can play in improving nutritional outcomes, multi-sectoral objectives and strategies remain minimal. The appropriate responses to multi-sectoral challenges depend on the source of the problem and the context [103]. For example, the World Bank [104] recommends a “think multisectorally, act sectorally” response that promotes intersectoral dialogue at each stage of intervention development while ensuring each sector is held accountable for their results through effective coordination and monitoring and evaluation. Strategies to address challenges in differing stakeholder perspectives and disagreements include collaborative problem-solving methods and capacity building regarding broker agreements, conflict resolution, and relationship and trust building [103, 105–107]. In Ethiopia, investment in education is prioritized to address the shortage of nutrition policy makers and experts [102].

Conclusion

The review of past and current national policies relevant to agriculture and food in Ethiopia, Ghana, Malawi, Nigeria, and South Africa demonstrates that nutrition-sensitive agriculture had received scant attention. Several reasons for this situation include limited attention to micronutrient-rich food production, weak multi-sector collaboration to improve nutrition, inadequate capacity for policy implementation, and insufficient market access for smallholder farmers. However, policymakers are beginning to recognize the importance of leveraging the agricultural sector to address issues of malnutrition in SSA. This has led to revision and development of new policies such as Ethiopia’s Nutrition Sensitive Agriculture Strategy and Nigeria’s Agricultural Sector Food and Security Nutrition Sector that prioritize nutrition-sensitive strategies as the main drivers in overcoming malnutrition. This follows policies from other countries in SSA that have been successful in integrating a focus on nutrition-sensitive agriculture. For example, Benin’s Action Plan for Food and Nutrition in Agricultural Sector (2015) and Zambia’s National Agriculture Investment Plan (2013) contains a strong focus on nutrition-sensitive agriculture by including explicit nutrition objectives, promoting the production of diverse food crops, working in partnership with other sectors, and in expanding market access for vulnerable groups [31, 108]. By incorporating recommended policy measures such as greater policy

coordination across sectors and stakeholders, improved policy implementation methods, strategies to increase producer market access, and an overall prioritization of nutritious foods, countries can start to inch forward in improving the nutritional status of their population.

Supplementary Information

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Additional file 1. An overview of the historical development of national agriculture and nutrition policies in sub-Saharan Africa

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