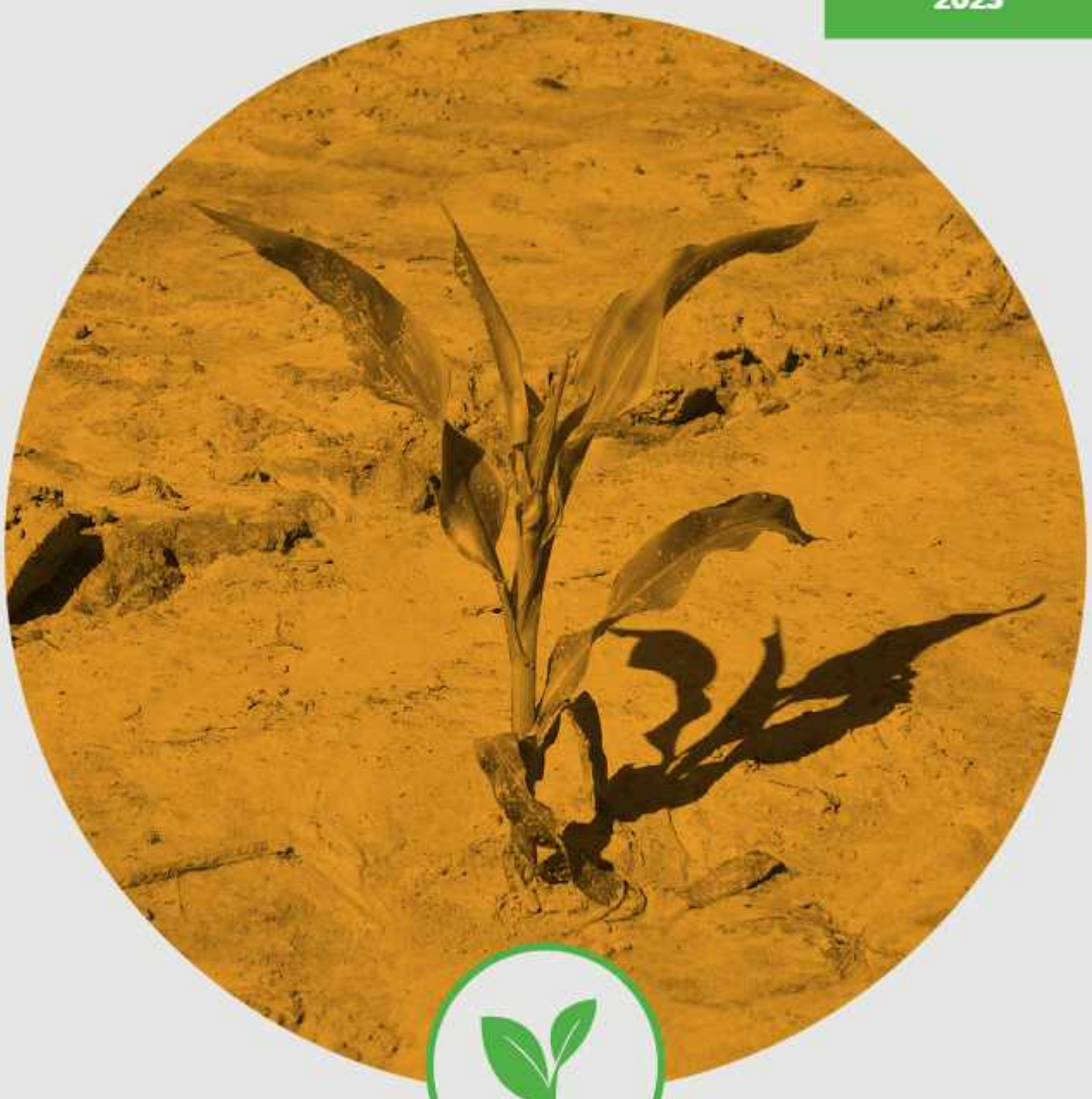
SOUTH AFRICAN COMMERCIAL BROILER POLICY BRIEF SERIES 2023



SHEFS

POLICY BRIEF 5

Scratching beneath the surface:

The commercial broiler system's climate change vulnerability, and its hidden impacts on the environment

WHAT IS SHEFS?

SHEFS (Sustainable and Healthy Food Systems) is an international research programme using novel methods to generate and synthesise evidence, and to help decision makers create policies that deliver nutritious and healthy diets in an environmentally sustainable and socially equitable manner. The programme is funded by the Wellcome Trust.

ABOUT THIS SERIES

This series of five policy briefs draws on research conducted by South African and United Kingdom-based researchers within the SHEFS consortium. The series seeks to encourage policy makers working on the commercial broiler chicken system in South Africa to adopt a broad systems-based perspective in their work. This brief highlights the system's impact on the environment, and its vulnerability to climate change.

BRIEFING 2
Highlights the systemic inequalities which are created by policies that favour large-scale commercial producers, and which, in turn, generate price-driven nutritional inequalities for consumers

BRIEFING 3
Explores the potential nutrition and health implications of policies aimed at increasing per capita consumption of broiler chicken meat

BRIEFING 1
Provides a broad overview of the challenges associated with current broiler industry policy in South Africa

BRIEFING 4
Highlights the fragmented nature of food safety governance within the context of the broiler chicken system and the potential risk of foodborne disease in South Africa

BRIEFING 5
Explores the hidden impact of the commercial broiler chicken system on the environment and the broiler system's climate change vulnerability

A closer look at the system's hidden environmental impacts, and its climate change vulnerability

AUTHORS: **KEVIN QUEENAN[1], SOLEDAD CUEVAS, TAFADZWANASHE MABHAUDHI, ROB SLOTOW, BARBARA HÄSLER**

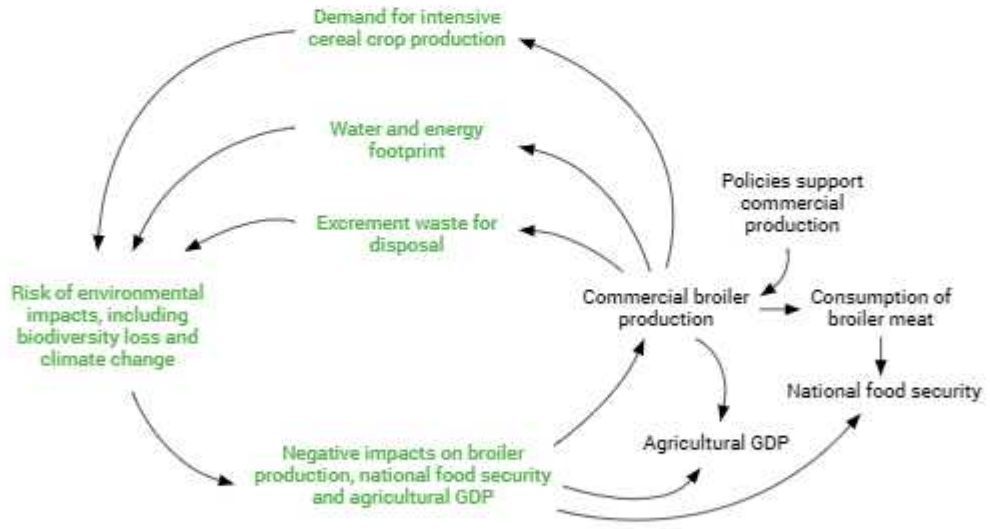
SUMMARY

This policy brief highlights the commercial broiler chicken system's climate change vulnerability and its hidden impact on the environment.

Livestock plays a significant role in the environmental impact of food production, contributing to climate change and biodiversity loss. Non-ruminant livestock, including broiler chicken production, are viewed as less environmentally damaging meat sources. However, while its direct requirement for land is relatively small compared to ruminants, commercial broiler production's major environmental impact is through the intensive production of cereals, upon which it is entirely dependent for feed production. Arable land in South Africa is limited, and cereal production for humans and for livestock feed is threatened by weather variability and climate change. Intensive cereal production contributes to greenhouse gas emissions, soil degradation and biodiversity loss. Broiler meat processing consumes water, and excrement waste is deposited in the environment with potential to contaminate water sources. Policies driving the increased production and consumption of commercially produced broiler meat must ensure that the system becomes both resilient to climate change and more environmentally sustainable.

FIGURE 1

■ Current focus of commercial broiler policies and their intended outcomes
■ Wider unintended consequences revealed with a food systems approach



RECOMMENDATIONS

Promote and support sustainable agricultural practices for cereal production and broiler waste management, to reduce environmental impacts of the broiler industry and to improve its climate change resilience.

Subsidise investment in water-saving and renewable energy infrastructure throughout broiler system.

[1] kqueenan3@rvc.ac.uk

Introduction

Global demand for food is rising alongside a growing human population. Government responses typically focus on food security, and on the availability and affordability of food, while ensuring the economic viability of the agricultural sector[1]. Global food production in its current form, however, is deemed unsustainable[2]. Food production contributes to the drivers of climate change, in turn undermining attempts to improve food security[3]. Agricultural systems that produce our food also generate 24% of global greenhouse gas emissions, use approximately 70% of freshwater resources, and contribute to biodiversity loss through land-use change and chemical use[3]. Livestock play a significant role in this environmental impact, with ruminant-based livestock products receiving most criticism, and products from non-ruminant livestock (poultry and pigs) being promoted as the least environmentally harmful[2]. However, our research questions this within the South African context.

South Africa's land is classified as primarily arid, semi-arid and dry sub-humid, with small areas classified as humid or moist sub-humid[4]. As a result, around 68% is suited for grazing alone, and only 14% is considered arable, with one fifth of this (3% of the total) being used for cereal production, most of which is rainfall dependent[5,6]. South Africa's geographical position exposes it to the weather phenomenon of the El Niño-Southern Oscillation[7]. The effects of this are likely to intensify due to climate change, and lead to more severe droughts and heavier summer rainfall and flooding[7,8]. Consequently, climate change poses a serious and current threat to the country's food security and its attempts to achieve the Sustainable Development Goal of Zero Hunger (SDG 2)[9]. South Africa is mostly self-sufficient in maize production, but around half of this is yellow maize used for livestock feed[10]. Broiler production is the single biggest user of livestock feed, consuming 30% of all feed produced[11]. Soybean is another important component of livestock (and broiler) feed, but local production falls short of demand by around 30% with the balance being imported almost entirely from Argentina, where the sustainability of production is questioned[12,13].

Per capita meat consumption in South Africa is the highest in Africa[14]. Within the past two decades, consumption of broiler chicken meat per capita in South Africa has almost doubled, and it currently makes up 60% of all the meat consumed[15]. This is primarily due to the improving socio-economic standards of the population and the relative affordability of broiler meat compared to red meat[16]. The commercial broiler system is the main supplier of broiler meat in South Africa, with the bulk of it being retailed through large-scale supermarkets and fast-food restaurants[17]. The commercial broiler system therefore requires closer scrutiny when considering the impact of the country's livestock-derived food on the environment and its links to climate change.

Research findings

Interviews with commercial broiler stakeholders revealed a greater concern about the impact of climate change on their systems than their system's own impact on the environment and contribution to climate change[18]. The former, indeed, poses several important threats; however, the latter should not be ignored (**Table 1**).

TABLE 1

CLIMATE CHANGE FACTORS AFFECTING THE BROILER SYSTEM, AND SYSTEM'S CONTRIBUTIONS TO CLIMATE CHANGE

CLIMATE CHANGE THREATS ON THE BROILER SYSTEM	BROILER SYSTEM'S ENVIRONMENTAL IMPACTS AND CONTRIBUTIONS TO CLIMATE CHANGE
Weather variability: droughts, floods affecting local cereal crop yields, water shortages for house cooling and carcass processing	Intensive cereal production: greenhouse gas emissions, non-renewable energy use, land-use change, inorganic fertiliser use, chemical pesticide and herbicide use, biodiversity loss, soil degradation
Lower yields: increased cost of feed and broiler production, potentially reducing affordability for low-income consumers	Water use: house cooling, drinking water and carcass processing
Heat stress: poorer productivity of chickens, increased broiler disease risk, increased foodborne disease for consumers	Environmental contamination: waste excrement, run off and water contamination, antimicrobial resistance
Change in wild bird migration patterns: potential increase in the risk of local avian influenza outbreaks	

The greatest threat from the climate crisis on the commercial production of broiler meat is the impact on the yield of cereal crops used to make broiler feed. Commercial broiler production relies entirely on concentrated feed, which represents 65–70% of broiler production costs[15,18]. Yellow maize is the main ingredient in broiler feed[15] and, similarly important to the human population, white maize provides 30% of the energy content in South African's diets[19]. A growing human population will raise the demand for white maize, and current broiler policies to increase local broiler production will raise demand for yellow maize. A trade-off between land use for white and for yellow maize is likely to intensify, given the limited amount of arable land available for cereal production[18]. This challenge is further exacerbated by the largely rainfall-dependent production of maize, and the impact of climate change on drought frequency and, therefore, crop yields.

The global cereal production system is under the same threats of climate change, population growth and increased demand from the rising consumption of livestock-derived food, in particular meat from broilers and pigs. The war in Ukraine brings a new threat to global cereal supply, and production costs worldwide are being affected by the rising costs of energy. Global supply and demand gaps will

"A trade-off between land use for white and for yellow maize is likely to intensify, given the limited amount of arable land available for cereal production"

drive up cereal and feed prices, threatening broiler meat's status as the most affordable meat option in South Africa, and potentially impacting the health, nutrition and wellbeing of low-income consumers in particular[19,20].

Additional climate change threats to the commercial broiler system include water shortages, which impact the supply of safe water (for drinking and use in processing), as well as water used in the cooling of temperature-controlled broiler houses[19]. The latter is of increasing concern as several areas of the country have been identified as vulnerable to climate-change-induced heat stress[21]. Heat stress will also affect broiler meat yields, due to reduced production performance of birds, increased stress-related disease risk and greater welfare issues[22]. Climate-change-induced weather variability is also recognised as a driver of changes in wild bird migration patterns, which will potentially increase the risk of avian influenza outbreaks in South Africa[20]. Higher ambient temperatures and water shortages, together with the impact of load shedding (intentional reduction of electric power) on refrigerated storage, present a perfect storm for increased risks of foodborne disease from climate change, particularly within households in resource-poor settings[19].

The bulk of the environmental footprint of commercial broiler production is associated with the production of cereals for feed[23]. Over the past two decades, the yield per hectare of maize in South Africa has risen almost 60%, mostly through the aggregation of smaller farms into larger, more efficient commercial enterprises, and the use of genetically modified varieties, inorganic fertilisers, and chemicals to control pests and weeds[24]. Policies within the South African Poultry Master Plan's strategy includes the expansion of maize and soya production locally, to support broiler feed production as a means to increase broiler meat supply. However, the continuation of this intensive production system for cereals is under criticism for its contribution to climate change through land-use change, greenhouse gas emissions, biodiversity loss, soil degradation and contamination of water with nitrates[25]. The bulk of water use within the commercial broiler system is in the processing of the meat, and in the cooling of environmentally controlled housing, and demand for the latter will increase along with rising temperatures[20]. Currently over 80% of commercial producers are estimated to rely on coal to heat broiler houses in winter, due to unreliable electricity supplies and the unaffordability of more sustainable alternatives[19]. The commercial broiler production system also generates excrement waste which is used as organic fertiliser, increasing the risk of nitrate runoff and eutrophication. Waste can also contaminate soil with antibiotic residues that potentially contribute to development of antimicrobial resistant bacteria in the environment, impacting both human and animal health[20].

RECOMMENDATIONS

Promote and support sustainable agricultural practices for cereal production and broiler waste management, to reduce environmental impacts of the broiler industry and to improve its climate change resilience.

Subsidise investment in water-saving and renewable energy infrastructure throughout broiler system.

Conclusion

Livestock production systems need to mitigate their environmental impacts while contributing to the achievement of the Sustainable Development Goals (SDGs). The commercial broiler system requires specific attention given the importance of broiler meat in South African diets, and the current Poultry Master Plan's strategy to maximise production. Future policies should look beyond increasing food security through intensive agricultural development, and ensure that production is climate change resilient and more environmentally sustainable, building towards fulfilling multiple SDG targets and aligning more with South Africa's National Development Plan.

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