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Perspective

The Drivers of Maize Area Expansion in Sub-Saharan Africa. How Policies to Boost Maize Production Overlook the Interests of Smallholder Farmers

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Abstract: Maize has become the second most produced crop in the world. Specifically, in sub-Saharan Africa, global statistics show that more and more land is being used for (small-scale) maize production to meet future food demands. From 2007 to 2017, the area on which maize is grown in sub-Saharan Africa has increased by almost 60%. This rate of expansion is considered unsustainable and is expected to come at the expense of crop diversity and the environment. Based on available literature, this paper explores the political and economic processes that contributed to the increased use of land for maize production in sub-Saharan Africa. It discusses population growth as an important driver. Moreover, it unravels some of the politics and narratives triggered by climate change that have paved the way for policy measures that aimed to boost maize production in the region. These measures, which often emphasize the need for increased production, the need for new technologies and resource scarcity, overlook the largest group of maize producers that are least powerful, but most crucial for food security in sub-Saharan Africa: smallholder farmers.

Keywords: land use change; maize; political economy; food security

1. Introduction

One of the most important global challenges of our time is meeting future food needs and tackling hunger and malnutrition in a context of climate change and growing populations. In 2017, 821 million people experienced hunger or malnutrition, which equals one out of nine people in the world. This number is still increasing, especially in Africa [1]. Climate change and frequent climate extremes are considered key drivers of increasing food insecurity in vulnerable areas and are expected to only exacerbate the problem in the future [2,3]. Increasing temperatures and droughts have been found to have a negative impact on the production of sub-Saharan Africa's most important staple crop, maize [2,4] and are expected to have severe impact on people's food security [5]. 'Zero Hunger', as the second of the sustainable development goals, and the recent publication of a report on Land and Climate Change by the Intergovernmental Panel on Climate Change (IPCC) [6], show that food security and more climate resilient agricultural practices (target 2.4) are high on the international policy agenda.

Maize has become the second most produced crop in the world. Specifically, in sub-Saharan Africa, more and more land is used for maize production. From 2007 to 2017, the area on which maize is grown in sub-Saharan Africa has increased by almost 60% [7]. While the crop is mostly grown by smallholder farmers, maize is among the crops for which many land deals across the world have been made. These land deals contributed to the increasing share of land used for maize production [8]. Although, as of yet, little research has been conducted into large-scale production of the crop in sub-Saharan Africa, the current rate of area expansion is considered unsustainable and is expected to be at the expense of crop diversity and the environment [9].

Based on available literature, this paper will elaborate on the political and economic processes that contributed to the increased use of land for food production in sub-Saharan Africa (SSA), particularly maize. What has driven investments in land for maize expansion? Section 2 of this paper will further elaborate on the importance of maize and the significant expansion of the crop in recent years in relation to the growing demand for it in SSA, driven mostly by population growth. Section 3 will explore how fewer tangible phenomena like climate change politics [10] and narratives of scarcity [11] can lead to, shape, and contribute to the land-based investments and their outcomes and form the basis for some of the policies and market instruments used by large international, regional, and national actors (discussed in Section 4) to regulate the maize sector and push for increased production of maize. I argue that these policies and instruments tend to neglect the interests of the largest group of maize producers, namely smallholder farmers.

In addition to this literature study, three months of fieldwork within selected maize growing areas in Ethiopia, Kenya, and Uganda will explore the politics, drivers, and outcomes that shape the expansion of maize production in sub-Sahara Africa's food system, as well as its effects on local food systems. This paper is part of an empirical study conducted by the Netherlands Land Academy (LANDac), based at Utrecht University, in collaboration with the International Maize and Wheat Improvement Center (CYMMIT), on the political economy of land-based investments in maize and their impact on local livelihoods in Ethiopia, Kenya, and Uganda.

2. Background

2.1. Maize expansion in sub-Saharan Africa

In a relatively short period of time, maize has become the main staple crop in many parts of sub-Saharan Africa. After epidemics of common staple foods (like millet) in the early 1900s, colonial governments introduced and promoted white maize as a subsistence and cash crop, because it is easy to grow and process [12]. In his book *Maize and Grace*, James McCann argues that because of these characteristics, maize 'is the ultimate "legible" food and crop, one that holds attraction for ambitious governments enamored with large-scale projects [13] (p. 205). McCann refers to the concept of 'legibility' by James Scott who defined it as the pursuit of modern governments to simplify people and nature to make them better 'readable' and easily governable [14]. This is not to say that the quick adoption of maize on the African continent happened only because of state intervention. Carefully selecting the appropriate crops and varieties each season, farmers rapidly incorporated the high-yielding crop into their farming practices [13]. As a result, today, maize is one of the most important staple crops, mostly grown by smallholder farmers for food. In Eastern and Southern Africa (excluding South Africa), maize accounts for 19% of the average calorie intake per capita and the demand for the crop as food will only be increasing [7,8], also as a consequence of population growth. In recent years, more and more maize was produced across the world and according to the latest statistics published by the Food and Agriculture Organization (FAO), maize has become the second most produced crop after sugar cane [15].

2.2. A Growing Demand for Maize

The increase in maize production and the expansion of land on which it is grown goes hand-in-hand with the growing global demand for the crop, for food, livestock feed, and as biofuel feedstock. Unlike high-income countries, where more than 70% of maize is grown for livestock feed, in sub-Saharan Africa, more than two-thirds of produced maize is grown for human consumption [9,16]. The annual Global Agricultural Outlook, published by the Organization for Economic Co-operation and Development (OECD) and the FAO [15], point out two main drivers for an increase in demand for agricultural products: population dynamics and per-capita demand growth. In other contexts, because maize is often used as animal feed, an increase in demand is often associated with an increase in the demand for meat. Over the years, this has been the main reason for rapid maize expansion, for example,

in China. Although meat consumption is expected to increase in SSA by 25% in the next decades, incomes are not expected to increase significantly and make meat consumption more widely accessible. On the contrary, per-capita, meat consumption is expected to decline slightly [15]. According to the OECD/FAO, population dynamics in Africa drive most growth of projected food use, attributing 90% of the expansion of cereals to population growth [15]. Therefore, because maize is mostly produced for food, the growing demand for maize is closely linked to the growing population in SSA. Processes of late, but rapid urbanization in SSA have also contributed to the increased need for cereals, including maize [1,2,13,16]. In 2007, McCann [13] (p. 214) points out the appearance of maize in urban agriculture and the potential benefits of this new form of artisanal farming. Preliminary findings from our recent field study; however, indicate that smallholder farmers in urban and peri-urban areas are increasingly displaced and maize production in these areas has become difficult because of high land prices and the ever-expanding cities [17].

New uses of the crop, besides food and feed have emerged over the past decades that have been driven by the contemporary narrative around climate change. Across the world, maize has been increasingly used for 'new' purposes as a so-called 'flex crop'. Borras, Franco, Isakson, Levidow, and Vervest [18] define flex crops as crops that have dimensions of 'multiple-ness' and 'flexible-ness'. Multiple-ness, according to the authors, refers to the multiple uses of the crop (e.g., for food and livestock feed). 'Flexible-ness' means that the use of a crop can be easily changed for different products (like corn oil or flour). The combination of multiple-ness and flexible-ness make a product more valuable and attractive for large investments [18]. Especially in high-income countries, maize is used as biofuel feedstock, mainly for ethanol production, driven by policies. With policy agendas across the world being more focused on energy use from renewable sources, the growing demand for biofuels in the US, Europe, and China led to an increasing demand for cereals of more than 120 million tons of mostly maize. This contributed to historical worldwide production levels of the crop in 2017 [1]. Although, further growth of maize production for biofuel feedstock is not expected in developed countries (where policies do not allow for biofuel feedstock expansion and put a halt on the demand), the FAO predicts that expansion of biofuel feedstock production in the global South will continue in the coming years, because several policies have been put in place that stimulate the use and increased production of biofuel [1]. Examples from sub-Saharan Africa include Kenya's Biofuel policy [19] and Uganda's Biofuels Bill [20]. It is, however, not clear whether maize, mostly grown as smallholder (food) crop in SSA, will be the main feedstock for ethanol or if the focus will be on crops such as sugarcane, oil palm, or rapeseed for biodiesel. In many countries in SSA, maize is prohibited to be exported outside the region or to be used for other purposes than food or feed. Uganda's Biofuels Bill, for example, states several times that biofuel production licenses will only be granted if feedstock production does not endanger the country's food security, although maize is appointed as a potential feedstock [20]. In South Africa, maize, being an important food crop, is banned from being used as biofuel feedstock.

2.3. Changes in Land-use for Maize Production

Whereas most increases in cereal production across the world have been the result of gains in yield, the increase in maize production in Sub-Saharan Africa was, and is expected to be the result of an expansion of harvested land [21,22]. This is not a surprise, when considering that the area harvested for maize in sub-Saharan Africa (excluding South Africa) increased with nearly 60% over the past decade [7], see Table 1. The significant area expansion of maize means that from 2007–2017, over 12 million hectares of land across SSA has been acquired and/or converted to produce maize for food [7].

For a long time, maize has been produced by smallholder farmers. But the literature suggests that more and more large-scale land-based investments have been made to produce maize and other food crops. Based on available data from the Land Matrix, a global land acquisition observatory, maize is among the crops for which most large-scale land deals are made [8]. As shown in Table 2, the Land Matrix has documented a total of 538 land deals made (partly) for the purpose of maize production over the past two decades. From those land deals, 174 were made in sub-Saharan Africa.

Table 1. Maize harvested area 2007–2017 in hectares.

	Eastern Africa	Middle Africa	Southern Africa (excl. S-A)	Western Africa	Total sub-Saharan Africa
Harvested area 2007	12.586.705	3.749.376	216.131	7.749.768	24.301.980
Harvested area 2017	16.737.314	6.861.763	336.736	12.947.199	36.883.012
Total increase	4.150.609	3.112.387	120.605	5.197.431	12.581.032
Increase in 10 years	33%	83%	56%	67%	60%

Source: FAOSTAT (2019): http://www.fao.org/faostat/en/#home.

Table 2. Number of land deals for maize production.

Target Region	Number of Maize Deals
Eastern Europe	239
Africa	174
Latin America	98
Asia	27

Source: adapted from Land Matrix data (www.landmatrix.com).

In the context of the recent maize expansion in SSA, the data presented by the Land Matrix is useful for identifying trends and provides in indication of the number and size of large-scale land deals. However, it does not provide the full picture. Much has been written about the socio-economic impact of large-scale land acquisitions on the livelihoods of local groups. These acquisitions are often called 'land grabs' because of the negative impact associated with them. Many scholars and NGOs aimed to get a better insight into the scale and impact of these acquisitions. Because large-scale land-based investments often imply land use change (from, for example, food crops by smallholder farmers to export-oriented crops by large companies), numerous studies from different localities in sub-Saharan Africa and beyond, associate these investments with the risk of displacement, loss of livelihoods, increased poverty, and food insecurity for local groups. At the same time, these local groups do not share the economic benefits of the investments [23–25]. In addition, increasingly, studies revealed the gendered impacts of the investments and show the severe impacts they can have on the livelihoods of women specifically [26,27].

While many of these studies rightfully uncover the negative impacts that can go hand-in-hand with these land acquisitions and call for more responsible investments, others have criticized the findings and methodologies of those researching the impacts of large-scale land acquisitions and stress the importance of rigor. For example, Oya [28] reflects on the use of databases that capture large-scale land deals. The non-governmental organization GRAIN and the International Land Coalitions' Land Matrix have compiled datasets that provide insight into large-scale land acquisitions that comprise over 200 hectares or more in low- and middle-income countries. Although the databases are useful to gain insight into a large number of deals and their scale, they are far from complete and several scholars have indicated the limitations of using these databases. For example, data collection is often based on media reports and crowdsourcing, which can result in a bias towards a particular region (mostly Africa) or actors (like China) [29–31] and exclude fully domestic acquisitions [32]. Some authors also indicate that many studies which focus on large-scale land acquisitions make use of problematic, and sometimes false dichotomies. By using dichotomies such as 'small versus large', 'national versus domestic', and 'subsistence versus market-oriented', there are risks of oversimplifying complex realities on the ground. At the same time, they imply a preference for small, national, and subsistence [28]. According to Borras and Franco [29], this has resulted in a dominant discourse about the recent boom in land acquisitions that describes the acquisitions as generally transnational and shady in character; leading to displacement or dispossession of small farmers; implying land use change away from food production; and mostly driven by Asian investors, among other things. However, by using this characterization, 'certain aspects of the current global land grabbing are not fully captured nor sufficiently contextualized by it', the authors argue [29] (p. 38). For example, it does not consider land use changes other than from food to non-food (e.g., from food to food or non-food to food) and differences in the direction in which land is being transferred other than from smallholder farmers to foreign investors (e.g., from the state

towards farmers or from farmers to other farmers). This argument is supported by studies undertaken by, among others, Jayne et al. based on nationally representative data that suggest a fast growing, but underreported number of medium scale farmers (owning between 5–100 hectares) across Ghana, Kenya, Tanzania, and Zambia, that outweighs the land covered by national and foreign international farms [33]. Other studies have used econometric modelling to identify a positive effect of this rise of medium-scale farms on household incomes (excluding the poorest households) in Tanzania [34].

The current rate of area expansion for maize production is not considered a sustainable way forward. After all, land is an exhaustive resource and the associated land-use change is expected to have negative impacts on crop diversity and forest conservation [9]. First, the expansion of maize increasingly substitutes other (traditional) crops [13]. This increases farmers' vulnerability on a household level, as well as for the food system [6]. Research has shown that farmers who diversify their crops are more resilient to climate change and better maintain soil fertility, for example in Ethiopia [35], where land use for maize more than doubled in the past decades [36]. Dan Taylor [37] studied the consequences of maize replacing resilient farming systems based on drought-resistant sorghum and millet in Southern Africa, which demonstrates the complex effects of maize substituting traditional crops. The author shows that a shift towards the cultivation of maize also means the abandonment of an agricultural and social system that was organized around the cultivation of sorghum, which must be protected from birds at key moments. Furthermore, cultivating maize and abandoning the traditional agricultural system may also mean 'de-agrarianization' and commodification [37] (p. 63). Second, cropland is often at the expense of forestland. Mostly driven by the increased need for agricultural products due to urbanization [38,39], it is known that deforestation has severe ecological consequences (e.g., carbon emissions, land degradation) as well as social consequences for the people who depend on land for food and other resources. Ordway, Asner and Lambin [40] found that from 2000 to 2015, maize expanded faster than any other crop in SSA. The authors argue that the rapid expansion of these commodity crops, including maize for national use as well as non-food crops for the international market, place increased pressure on tropical forests in SSA. Thus, the major area expansion of the maize, as discussed above, invites further research in the investors, their drivers, incentives, and the implications of the investments for smallholder farmers. From a political economy perspective, the remainder of this paper will explore the drivers of the maize area expansion and investments in maize in sub-Sahara Africa, starting with climate change politics and narratives. [1]

3. Climate Change Politics and Narratives

The foreseen effects of climate change in combination with population growth have triggered governments and donors to invest in the quick expansion of maize in terms of land use (through land-based investments) as well as investments in technology and increased yields (through agricultural policies), with the ultimate aim to increase production and make maize varieties more climate resilient. There is a general consensus, again confirmed by the latest report on climate change and land by the Intergovernmental Panel on Climate Change, that urgent action is necessary to transform the current food systems and ensure future food security [6]. However, to realize systemic transformation, it is important to understand the structures, ideas, politics, and narratives that feed into current practices. Therefore, before discussing some of the policy measures that may directly contribute to the current trend of maize expansion, this section will first discuss less visible politics and contemporary discourses that emerged in response to climate change and the need for food security that shape and lead to the policy measures and investments discussed in Section 4. These narratives and politics that have emerged from the notion of climate change, especially those informally constituted, may be less visible,

[1] An additional 3-month qualitative fieldwork in major maize growing areas in Ethiopia, Kenya and Uganda will explore the type of investments and their impacts on local livelihoods. Findings of the study are forthcoming.

but not less important because of their impacts on the way natural resources are accessed, used, and controlled by different actors [10].

In the following, this paper will discuss *narratives of scarcity* [11] and *climate change politics* [10] as two different, but closely, related phenomena discussed in recent academic literature that reflect on the politics that take place in the international arena related to climate change and food security. In addition, in line with Borras and Franco, I argue that these processes described by the authors indirectly drive many of the aforementioned policies in the maize sector in SSA and contribute to the expansion of maize in SSA.

3.1. Climate Change Politics

Franco and Borras [10] elaborate on the concept of climate politics, defined as 'the dynamics within and between the implicated spheres of social structures, institutions, and political agency (. . .) within the state and in society that set and shape the meanings of climate change, its causes and consequences, how it can be addressed, by whom, where, and when [10] (p. 192). On one hand, climate change politics thus may involve formal policies or projects initiated by the state or multilateral organizations to adapt to or mitigate the effects of climate change. For example, as a result of population growth and the need for more food, national governments in the region strive for food self-sufficiency through policies and politics that stimulate farmers to grow more maize and optimize yields or encourage large-scale land-based investments [41]. These include policies discussed in Section 4. On the other hand, informal politics may take place that are less visible, but not less real, like land speculation [10].

Franco and Borras elaborate on three ways in which climate change politics can drive changes in food systems and land-use change in particular. A first example is the rise of flex crops [18], already discussed in Section 2.2., that has triggered land grabs and indirect land-use change. Flex crops would not have been produced on such a large scale in the global South today if they had not been driven by different (EU and US) policies in response to climate change. Second and most relevant for this paper, for many years, states and donors aimed to 'stop some forms of agrarian production systems and ways of life, especially shifting cultivation, pastoralism, and some forms of artisanal fishing (. . .)' [10] (p. 194) because they were deemed unsustainable, unproductive, or even environmentally destructive. This has formed the basis of the recent notions of Climate Smart Agriculture (CSA), a set of agricultural strategies that emphasize increased productivity, increased resilience, and reduced emissions through industrial farming and technological advancement [34]. Third, climate change politics can have trans-local effects on land investments: although climate mitigation or adaptation projects may avoid a land investment in one place, the investor may just move to a nearby place [10].

3.2. Narratives of Scarcity

As part of climate change politics, Scoones, Smalley, Hall, and Tsikata [11] elaborate on contemporary narratives that shape and contribute to the outcomes of land investments. More specifically, the authors describe the role of 'narratives of scarcity'. Recognizing that scarcities do exist, the authors point out that the contemporary framing of resource scarcity (like food and land) "are presented as a deliberate political strategy, justifying resource control, appropriation, dispossession, population restrictions and the securing of exclusionary property rights" [11] (p. 231). Based on an analysis of 135 frequently cited documents on the global land rush, the authors identified four narratives of scarcity constructed by international organizations, African regional organizations, investors/financiers, and agribusinesses. They show how these narratives have affected the direction and outcomes of investments in land.

The first narrative, 'limits and urgency' shows commonalities with (neo-)Malthusian perspective on absolute scarcity and tells a story of a major challenge that is very urgent: feeding billions of people in the future with limited resources. The second narrative is that of abundance, emptiness, and under-use, particularly that of land in sub-Saharan Africa, to justify land investments. This narrative frames land in SSA as underutilized and 'empty', with high potential. The third narrative suggests a technical

and investment solution to the problem of scarcity, proposing new technologies and agricultural intensification [11]. An example of this narrative can be found in the OECD/FAO agricultural outlook:

"Improved seed varieties will continue to drive increases in yield and the increasing number of commercial farms, particularly in Africa and the Black Sea region, will facilitate access to new technologies, including machinery and extension services. Large farms could also improve productivity, particularly through more efficient use of inputs such as fertilizers and farm chemicals". [15] (p. 126)

This narrative is very much in line with thinking about the green revolution (also discussed in Section 4.1). Within this narrative, the difference between potential and actual yields (the yield gap) in SSA is often discussed. The latter two narratives are often applied in relation to maize production, as shows in a report from the World Bank, *Growing Africa: Unlocking the Potential of Agribusiness* [42]:

"Most African countries have a comparative advantage in agriculture. Africa has more than half of the world's agriculturally suitable yet unused land, and its impressive water resources have scarcely been tapped. Although rapidly growing local and regional markets could be partly and efficiently sourced from imports, Africa's abundant natural resources and exploitable yield gaps (figure C), and an improving investment climate open major opportunities on the supply side, too." [42] (p. xvi).

In the text, Figure C shows major maize yield gaps in Malawi, Ethiopia, Nigeria, Uganda, and Mozambique, see also [43,44]. The fourth and final narrative described by Scoones et al. [11] emphasizes comparative global opportunities and Africa's potential contribution in 'feeding the world'. Briefly summarized, all narratives emphasize the unused potential of land and resources in sub-Saharan Africa, while at the same time proposing mostly technical solutions. They do so, the authors argue, without including the political nature of scarcity, how scarcity can be 'manufactured', through contestations between different interest groups and can be affected by (historically rooted) inequalities and class differences [11].

4. Policies to Boost Maize Production

The politics and narratives described above have contributed to shaping the way that land and food production is governed by the international community and national governments and feed into international, regional, and national politics and policies that have had major effects on the way maize is grown, traded, and consumed in sub-Saharan Africa. For a long time, governments have aimed to regulate and control the production and trade of maize across SSA in different ways through policy measures [45]. Without aiming to be exhaustive, this section will provide examples of such measures and policies in different countries. First, on an international level, it will discuss the call for a new green revolution in Africa that can still be recognized in many policy interventions within the maize sector in SSA. Second, this section will discuss regional trade and country policies in SSA that play an important role. Third, this section will discuss the role of policy instruments that use subsidies to encourage maize production and a stable market. Despite their differences, research points out that overall, these widely used policy measures seem to structurally leave behind the interests of the poorest and largest group of smallholder farmers and are often mostly beneficial to the (political) elites and large producers.

4.1. A green Revolution in Africa

In line with the third narrative elaborated upon by Scoones et al. [11], for many years until today, policies, investments, and projects have been directed towards technical fixes and modernization to increase agricultural production of maize and other food crops in SSA. For example, in the Global Agricultural Outlook 2019 [15], the OECD/FAO argues for policy measures directed to new technologies, extension services, large farms, and more efficient use of inputs to boost future productivity of food production [15]. A focus on boosting productivity and promoting technology and agricultural intensification is not a new strategy referred to by the international (donor) community. Many politicians, donors and scholars have called for a new green revolution in Africa, referring to a period between the 1940s and 1970s during which mainly the United States and philanthropic organizations (led by the

Rockefeller Foundation) funded intensive agricultural developments in the form of, among others, research, technology (hybrid seeds) and inputs (fertilizers) that focused mainly on boosting productivity. This indeed led to record harvests in many countries in Latin America and Asia where new technologies were adapted [46,47] and food production grew faster than the population [48]. In debates about the green revolution, critics acknowledge the success of the green revolution in developing new technologies and high-yielding varieties, but argue that that it did not assist the world in producing sufficient food to eradicate hunger [49] and did not consider inequality and distribution of food [50]. In addition, James Scott also describes the effects of green revolution interventions on the rich and poor that enlarged inequalities [14].

Several authors describe how the green revolution 'bypassed' Africa, because of a different mix of crops and varying climatic and agro-ecologic conditions [51,52] in addition to poor infrastructure, political instability, and a lack of institutional support [53] and the absence of social mobilization in Africa [54]. However, Patel [47] and an independent evaluation of the World Bank [55] point out that most African governments were, at the time, heavily indebted and subjected to the World Bank's structural adjustment programs that focused on market liberalization, export, and phasing out subsidies for services better provided by the private sector. Their tight budgets simply did not allow the subsidies and costs associated with the green revolution. However, despite this 'bypassing', many donors and countries have implemented policies that are aligned with green revolution thinking that focus on boosting productivity through the adoption of new varieties, more intensive use of chemical fertilizers, and the formalization of land tenure.

In response to the green revolution and the call for a new green revolution in Africa, many critics have argued that this approach does not consider political, economic and social factors (e.g., the aforementioned inequality and food distribution) that play an important role in food systems. Countering the green revolution ideologies and a definition of food security that ignores power, ownership and control over the food system, in the 1990s, International Farmer's Movement Via Campesina introduced the concept of 'food sovereignty', defined in short as 'the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems [56]. Although food sovereignty nowadays has gained momentum and place in international debates about food systems, as well as in the recently published IPCC report on Climate Change and Land [6], green revolution thinking and policies are still relevant today and contribute to a push by powerful actors towards increased production and agricultural intensification by, for example, stimulating transformation from traditional farming systems based on polyculture and subsistence towards the adoption of modern farming systems: the outcomes of which are not only positive. In line with findings of Scott [14], Dawson, Martin, and Sikor [57] who critically analyzed policies in Rwanda that aim to formalize land tenure and regulate farming practices (e.g., towards the adoption of hybrid seeds, subsidized chemical inputs, and credit schemes) and concluded that the measures increased inequality and contribute to increased landlessness, poverty, and food insecurity, especially among the poorest farmers.

4.2. Regional Trade Policies and Export bans

Several countries in SSA where maize is the main staple crop, including Kenya, Mozambique, Rwanda, and Zimbabwe, are generally maize deficit and depend on imports from surplus countries like Uganda and Tanzania [58]. Officially, regional organizations like the South African Development Community (SADC) and the Common Market for Eastern and Southern Africa (COMESA) promote free trade in the region, but several policies and national interests restrict free trade of food commodities. An important example is the use of export bans that (temporarily) prohibit formal trade of maize with other countries, to ensure the domestic availability of food, but also to ensure a stable food price mostly for consumers. While a thorough analysis of these policies is beyond the scope of this paper, the assumption is that these policies can contribute to more stable and lower food prices for consumers, because maize remains within the country to be sold. Porteous [59] identified 13 export

bans over ten years in Ethiopia, Kenya, Malawi, Tanzania, and Zambia. In an exploration of the effects of those export bans, the author concludes that rather than stabilizing the prices, export bans seem to "destabilize markets, leading to increases in both domestic prices and domestic price volatility" [59] (p. 26), possibly because an export ban encourages traders to store maize, leading to an increase in price in both origin and destination countries. Furthermore, Diao and Kennedy [60] argue that export bans may slightly benefit urban elites through lower consumer prices, but are more likely to harm the rural poor through decreased prices for producers. This causes poverty rates to rise and has a negative effect on long-term growth [60]. In addition, when farmers are restricted to sell their maize for a higher price elsewhere, farmers may abandon the crop which further decreases the domestic supply [59–61]

4.3. Public Food Reserves and (input) Subsidy Instruments

National governments in SSA also shape and regulate the production, trade and consumption of maize through subsidy programs. A first example of such instruments are public food reserves. Countries like Kenya, Malawi, Rwanda, Tanzania, Zambia, and Zimbabwe are known to have price stabilizing and strategic grain reserves in place. In most of these programs, government bodies buy excess supply and sell stocks when prices usually increase at a maximum (subsidized) price [45,58]. A study on the market involvement of Kenya's National Cereals and Produce Board (NCPB) undertaken by Jayne and colleagues [62] shows that this strategy can have a positive effect on price stability. However, the study also found that, because most rural households are net buyers of maize, this policy has resulted in an income transfer from poorer and small households towards the larger and more wealthy producers of maize in Kenya. In addition, Korner [58] points out that maize production in countries with reserves and price stabilization programs has not increased as much as in countries that do not employ such instruments, possibly because the artificial prices discourage producers to become more efficient or make necessary investments.

Input subsidy programs are another well-known example of governments and donors to stimulate food production through increasing land productivity and by lowering the costs of inputs. Much in line with green revolution strategies, the programs reduce the costs of inputs like seeds and fertilizers to boost production. In 2011, 10 sub-Saharan African countries spent USD 1.05 billion or up to 28.6% of their agricultural spending on input subsidy programs [63]. While there is evidence that they can raise productivity, they are often untargeted and do not usually reach poor farmers and input subsidies are highly political: farmers appreciate free inputs and politicians gain votes through this type of visible measures [58,63,64]. Chinsinga [64] highlights the case of the Agricultural Input Subsidy Programme (AISP) in Malawi implemented from 2005 that has been considered highly successful in boosting the country's maize production. Through the program, 1.5 million maize farmers received fertilizers and hybrid seeds at a highly subsidized prize. However, the author argues that it is mostly the multinational seed companies who benefit because they have a guaranteed market: because of the subsidy, farmers use hybrid seeds instead of non-commercial varieties and the program included maize only. Other beneficiaries include newly emerged agro-dealers and contract seed growers as well as elite farmers that profit from the highly political beneficiary selection process. Thus, most farmers consider themselves as losing out. Chinsinga concludes: "The implementation of the AISP and the subsequent dominance of Hybrid maize is a result of political maneuvering, and a coalition of interests, involving the government (with an eye to political success), multinational seed companies (keen on market dominance) and political elites (able to cash in on the business generated, or patronage spread)." [64] (p. 67).

5. Discussion and Conclusion

This paper explored the increased use of land in sub-Saharan Africa for maize production and several factors that have contributed to this area expansion. Within a relatively short time, maize has become one of the most important staple crops within sub-Saharan Africa, where, over the past ten years, the total area covered by maize has increased by 60%. Most of this growth took place in Western

and Eastern Africa [1]. Historically, maize has been grown by smallholder farmers, but data and previous research shows that the crop is increasingly grown on large- and medium-sized farms [8,33]. This indicates that maize is not only expanding, but production is also shifting from smallholder farmers to other producers. This expansion of maize means land-use change at the expense of other crops and/or nature and at current rates, is considered unsustainable [9].

This paper has explored factors that have contributed to these changes. First, because in SSA maize is generally produced for food, most of the crop expansion has been attributed to rapid population growth and urbanization [13,15] and that in the coming years, the demand for maize as livestock feed will only be growing in the region. Second, this paper elaborated on the way climate change has triggered new politics and narratives that shape the way land and food production is framed. These politics and narratives, that often focus on the need for increased production, new technologies, and resource scarcity have paved the way for different policy measures that have aimed to boost maize production across SSA, including a set of measures under a call for a green revolution in Africa, regional trade policies, export bans, public food reserves, and input subsidies. While all these measures have pushed for increased productivity, this paper argues that they structurally ignore and leave behind the largest group of maize producers that are least powerful, but most crucial for the food security of a major part of SSA's population: smallholder farmers and the rural poor. A similar argument is made by Dan Taylor [37] who discusses the meta-narrative of climate change: a narrative that nowadays can encompass any subject raised by powerful actors. However, as the author argues: "The discourse of development has become confused with a more recent and contemporary discourse of climate change" [37] (p. 65), while for the rural poor, climate change is one of many challenges. It is the voice and interests of the rural poor, the diverse and complex smallholder production systems that need to be more carefully considered when taking measures towards a more sustainable and resilient future [37].

The recent IPCC report on Climate Change and Land [6] already shows a change in discourse from a focus on technology, intensification, and increased productivity (away from 'traditional and inefficient production systems') towards resilient and diverse systems in which smallholder farming systems are fostered. For example, it recognizes that both technological advancement, crop diversity, as well as food (and seed) sovereignty contribute to sustainable and resilient farming systems and that smallholder farmers are crucial for food security. The report provides a wide range of land-related adaptation and mitigation measures to ensure future food security within and outside SSA. However, much more needs to be done to ensure future inclusion of smallholders. The findings of this study provide insight into the drivers of the current maize expansion and highlights the importance of understanding underlying political-economic structures that will need to be addressed to implement any adaptation or mitigation measures that aim to make food systems in SSA, in which maize is the most important staple, future-proof. However, further empirical research is necessary to explore how the political economy of the current maize expansion in different countries affects food security and to find out how current challenges and power imbalances can be overcome to realize a more sustainable and equitable food system that includes the interests of smallholder farmers.

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