FOOD SOVEREIGNTY AND DEPENDENCY

The case of GMO crops in sub-Saharan Africa

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Abstract

In this thesis, I look at the dynamics of food sovereignty in sub-Saharan Africa, and the position of GMOs within these, as well as patterns of dependency. Dependency is understood through net food import and single commodity export. I use regression analyses to understand the phenomenon of food sovereignty in sub-Saharan Africa, before qualitatively assessing the cases of Burkina Faso and Nigeria. Lastly, I discuss my findings and the usability and validity of dependency theory. I conclude that GMO using countries are generally less prone to dependency, that efforts to further food *security* do seem to be working, and that single commodity exporting countries are more prone to dependency. However, in Western Africa, use of GMOs and dependency seem to go hand in hand, particularly as conflicts around single commodities harm local populations, and multinational corporations like Monsanto push foreign policies that do not benefit farmers. I therefore find that dependency theory provides a meaningful critique of neoliberal policies pushed by the global North, which keeps sub-Saharan countries in a state of dependency.

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1. Problem area

Food scarcity in Africa is a recognized problem globally, and many people in especially sub-Saharan Africa rely on agriculture, and trade in agricultural products (Haile-Gabriel 2021). Intra-African agricultural trade is below 20%, whereas in e.g. Europe it is at more than 60% (Mbonde 2022), meaning that sub-Saharan agricultural trade is largely international, thus making the region highly dependent on states in other regions, particularly Europe (Wetzels 2021). The term *food sovereignty*, coined by the peasants' movement La Via Campesina, is a critique of the term *food security*. Food *security* means all people have access to safe and nutritious foods which meet their preferences and needs (International Food Policy Research Institute). Food *sovereignty*, on the other hand, consists of a set of goals meant to let people, countries, and states decide for themselves what their agricultural and food policies should look like. Food sovereignty prioritizes e.g. (female) farmers' rights, local production, culturally appropriate foods, and freedom from liberalization of food trade (La Via Campesina 2003).

In sub-Saharan Africa, farmers experience a range of problems with both harsher climates and more insistent pests than seen in e.g. Europe (African Biosafety Network of Expertise A). The debate about genetically modified organisms (GMOs), and their use in agriculture, has been going on for over 20 years, and there is still no global consensus on the matter. EU follows a very precautionary approach, and due to the trade relations between Africa and the EU, African states are generally precautionary as well. Because of the many possibilities in gene-editing, GMOs have been proposed as a solution to hunger in sub-Saharan Africa, and many countries in the region have either begun trials or are actively growing GM crops (Elliott & Keller 2016; Wetzels 2018). One of the biggest problems that need to be addressed in the debate is the question of public acceptance. Anti-GMO activism is rampant in Africa, in part due to the dominant anti-GMO discourse in Europe. The complete banning of GMO imports in many European countries may keep African policy makers from accepting GMOs (Afedraru 2019).

GMOs are thus a contested product group, but in the fight for food sovereignty, they may prove useful. However, the role of Europe may make it difficult for African states to actively create their own food and agricultural policies. In this thesis, I am therefore using dependency theory as a framework to understand sub-Saharan states' place in the agri-food trade network, with a particular

focus on how the use of GMOs figures into a bigger framework of food sovereignty. Working with the concept of *power*, I aim to better understand the intersection of dependency and food sovereignty through statistical analysis and qualitative interpretation. I will also discuss my findings and their implications for dependency theory.

1.1 Research question and subquestions

The issues presented above may best be analyzed through the following research question: *How does use of GMOs figure into food sovereignty in sub-Saharan Africa, and what can this tell us about dependency in a theoretical context?*

The analysis is structured through the following subquestions:

- *How can we use statistical analysis to understand the apparent phenomena of food sovereignty and dependency in sub-Saharan Africa?*
- *What do these results and the literature tell us about the apparent phenomena in the region?*
- *How can we utilize dependency theory to understand relations between sub-Saharan Africa and the core countries, and determine the validity of the theory?*

The subquestions were chosen to encompass two levels of analysis (rooted in my choice of ontology elaborated upon in *Section 4.1*), as well as a theoretical discussion. The first subquestion leads to an assessment of the empirical field, i.e. the apparent phenomena of food sovereignty and use of GMOs in sub-Saharan Africa, as well as dependency. The second subquestion moves the analysis to the underlying reasons behind these phenomena, which are analyzed qualitatively, in part based on the literature review found in *Section 2*. The last subquestion is aimed at a discussion of the relationship between the analysis and the choice of theory. This means that I will discuss what sub-Saharan Africa's experience with GMOs and food sovereignty can tell us about the usability and validity of dependency theory.

1.2 Thesis structure

The study is constructed as follows: In *Section 1*, I have introduced the problem area. In *Section 2*, I introduce the state of the art through a quantitative literature study, focusing on literature that deals with food sovereignty, Africa, biotechnology, and trade. In *Section 3*, I discuss the usability and limitations of dependency theory. In *Section 4*, I explain the project's methodology and methods, and thereby the analytical strategy. In *Section 5*, I conduct the regression analysis and interpret the results qualitatively. In *Section 6*, I discuss my findings and their implications for dependency theory. In *Section 7*, I conclude. All tables and figures in the thesis are made by me, unless otherwise specified. Terms are italicized when I discuss their meaning.

2. State of the art

In this section, I conduct a quantitative literature search and discuss the state of the art. The literature review provides the qualitative basis from which I analyze the statistically assessed relationships between variables. The process of selection is showcased in the following PRISMA flowchart:

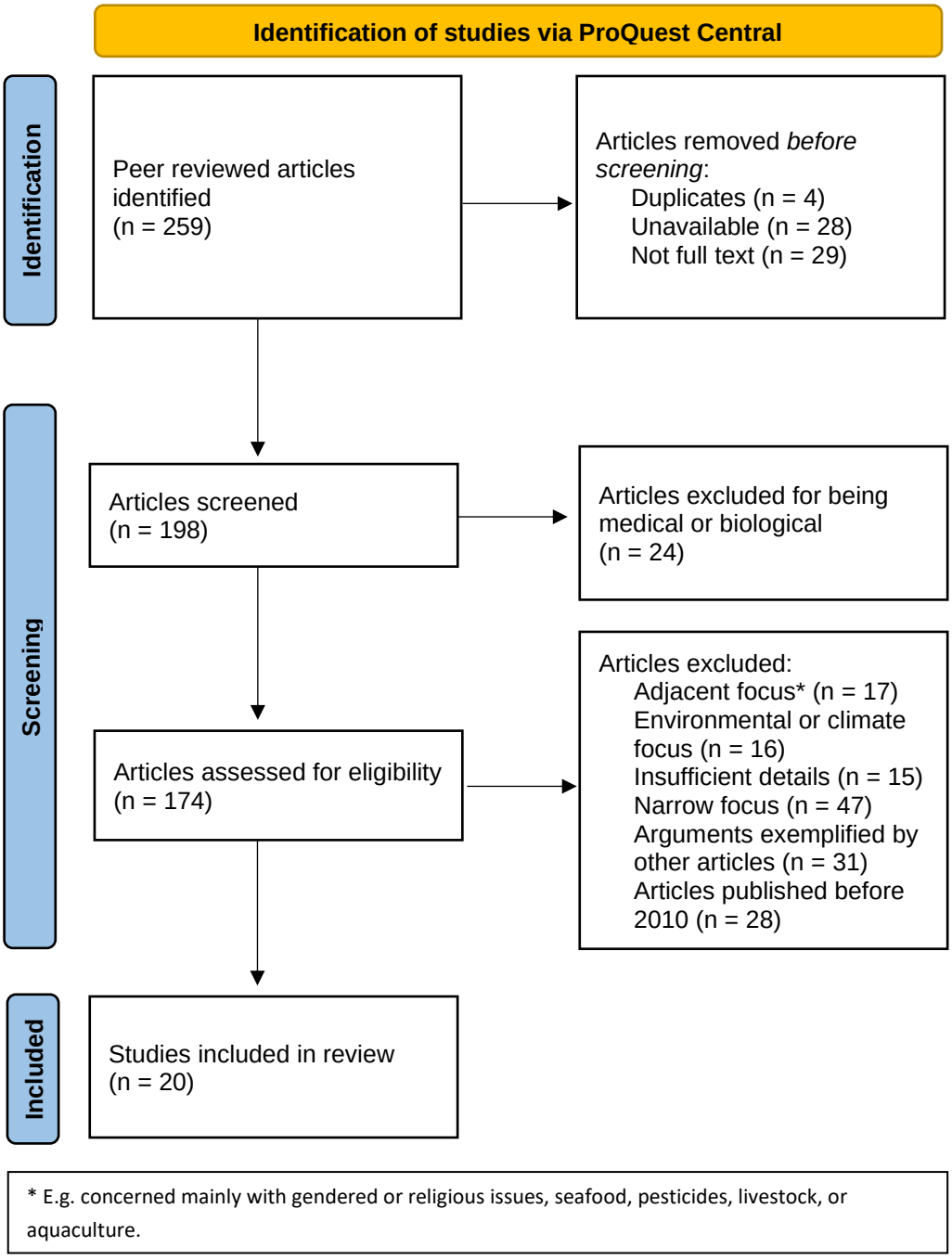


Table 1: Search terms used in the literature search

Group	Terms
Food sovereignty	"Food sovereign*" OR "food security" OR "food justice" OR "food regime"
International trade	"International trade" OR "African trade" OR "African export" OR "African import" OR "African market" OR "Africa-EU trade" OR "Africa-Europe trade" OR "Agro-food export" OR "trade regime"
Geography	"Africa" OR "sub-Saharan Africa" OR "SSA"
GMOs	"GMO food" OR "GMO crops" OR "biotech* in agriculture" OR "agricultural biotech*" OR "modified crops" OR "genetically engineered crops"

The search is designed with the aim to keep the debate current, focused, and reflective. All search terms were used in one search on ProQuest, a universal database. The selection process reveals common themes: food security and sovereignty, property rights, public opinion, regulation, sustainability, and trade. In summing up the key arguments, Ronald (2011) writes about the positive impact of GMOs on food *security*, while Grey & Patel (2015) puts emphasis on the rejection of GMOs within the food *sovereignty* paradigm. Pachón-Ariza (2013) as well as Shilomboleni (2017) write about differences and similarities between the two, which I will elaborate on in *Section 3.2*. Collier (2012) finds that regulation of biotechnology and patents is incredibly difficult, but very important, especially for the analyzed small-scale farmers in South Africa, while Olusegun & Olubiyi (2017) find that it is important for developing countries to adhere to international agreements like TRIPs in protection of plant varieties. Schnurr & Mujabi-Mujuzi (2014) analyzes methods of inclusions of farmers, while Beghin & Gustafson (2021) provide a more general review of consumer attitudes, finding that social benefits from GMOs are more important for consumers than economic benefits. For regulation of GMOs, there is an emphasis on the importance of socio-economic considerations in the article by Binimelis & Myhr (2015), and an emphasis on misinformation causing regulatory delays in the article by Smyth (2017). Sustainability is reachable through use of biotechnology, according to both the article by Travella et al. (2019) and Kyetere et al. (2019). GMOs are also not proven to harm trade, according to Xanat et al. (2018), particularly if countries adhere to the precautionary principle, as found by Laxman & Ansari (2011). Thus, while many studies agree on the usability of GMOs, there is a need for thorough regulatory frameworks. The divide between food

security and *sovereignty* is important, and I will discuss the implications of both throughout the thesis.

I have categorized the literature according to the elements of this thesis. This allows me to discuss findings that have implications for my own, while excluding literature that is very adjacent, or deals with subjects not dealt with here. The categorization can be seen below:

Table 2: Categorization of articles

	Food sovereignty	International trade	Mixed concepts
Sub-Saharan Africa	Shilomboleni (2017), Ros-Tonen et al. (2015), Pachón-Ariza (2013)	*None*	*None*
GMO crops	Grey & Patel (2015)	Laxman & Ansari (2011), Xanat et al. (2018), Smith et al. (2021)	*None*
Mixed cases	Schnurr & Mujabi-Mujuzi (2014)	Timpo et al. (2017)	*None*

Literature focusing on food *security* is in abundance, but when focusing on food *sovereignty*, fewer articles are found. This is presumably due to the widespread use of *food security* by international organizations and nations, which therefore pushes food sovereignty into the background. The categorization shows that the deliberate use of food sovereignty is lacking in literature dealing with sub-Saharan Africa, GMOs, and trade. Searching simply for peer reviewed articles about *food sovereignty* on ProQuest yields 4.960 results, not controlled for duplicates, unavailable texts, or adjacently focused articles. The same search for *food security* yields 140.777 results. Further, many social science studies on GMOs in Africa focus on farm-level impacts of GM crops, whereas only a smaller number of studies focus on international trade (Fischer & Eriksson 2016). I therefore view food sovereignty related to international trade to be an under-researched subject relative to food security, making my thesis academically relevant.

Although GMOs are generally thought of as incompatible with food sovereignty (Grey & Patel 2015), several studies contain inclusive frameworks for collaborative efforts, plant variety coexistence, and regulatory frameworks. E.g. the issues of seed patents as an issue of dependency (Wise & Veltmeyer 2018) and regulation of coexistence between GM and non-GM crops (Timpo et al. 2017) are

common concerns. Ros-Tonen et al. (2015) propose a framework of value-chain collaboration, which is meant to enhance small-scale farmers' voices in trade relations that they still benefit from, thus furthering food sovereignty without rejecting trade. While there are many issues to consider, GMOs could in theory be used within a framework of food sovereignty. Inclusion of farmers has not been done in a productive manner, but Schnurr & Mujabi-Mujuzi (2014) propose participatory learning for farmers, so they fully understand, and can voice their opinions on, GMOs. Doing this, they found that farmers are generally optimistic about the technology, but worry about regulations, and the role of corporations (Schnurr & Mujabi-Mujuzi 2014). This further puts emphasis on the need for a regulatory system not based on privatization, a point which many pro-GMO studies often overlook (Toft 2012). The positive and negative effects of GMOs have also been found to be a consequence of regulation. Regulation of trade in GMOs by the WTO has failed underdeveloped countries, particularly in unequal negotiations (Laxman & Ansari 2011). Thus, a pattern of dependency is apparent in trade negotiations. Non-Western countries are increasingly important in GMO trade networks, but the global North still mainly leads these networks, while production is found in the global South (Xanat et al. 2017), again showing a typical pattern of dependency. As genetic engineering becomes more common in some regions (e.g. Asia and Latin America), countries like China may seek to invest in the development of GM technologies in Africa, thus weakening the influence of Europe and the US. But the possible effects of this on trade are unknown (Smith et al. 2021). This signifies a strong element of dependency in the context of GMOs – both the commercial, political, and economic elements of GMOs are largely controlled by the global North, even in sub-Saharan Africa.

3. Dependency theory

Using dependency theory, I look at power structures between core countries in the global North (mainly Europe and the US) and peripheral countries in sub-Saharan Africa. *Structure* here refers to the division of the world economy in two parts – the industrialized and wealthy core countries, and the underdeveloped peripheral countries. This structure is what the theory is critical towards and attempts to find solutions to (Styve 2017:18-23), largely meaning a critique of capitalism and neoliberal policies as a one-size-fits-all. While the theory urges countries to pursue self-reliance (Ferraro 2008), there is no clear consensus on how to achieve this - a point which I will return to in a critique of the theory in *Section 3.3*. The *structure* is a remnant of colonial times, meaning that Europe has exploited Africa to develop themselves, thereby keeping Africa in a state of *underdevelopment*. Because of the inequality of countries, *power* becomes a key concept (Matunhu 2011; Ferraro 2008). This will be conceptualized in *Section 3.1*. The structure is changeable, as underdeveloped states may gain prominence in global markets, and thereby a stronger voice in trade negotiations. However, the theory posits that the global North upholds the unequal structure by e.g. limiting access to technology (thus "kicking away the ladder") and by continuing to exploit the global South and creating a global trade system wherein the global South provides raw material and low value products to the global North, who in turn create high value, "finished" products.

There are different theoretical notions as to what *development* and *underdevelopment* means. modernization theorists saw development as a route to modernity, meaning that the Western trajectory was the desired one. In dependency theory, the same position is used to explain the state of the world, although the theory is critical towards it and aims to change it. Thus, development and underdevelopment are "different sides of the same coin" (Crewe & Axelby 2013:8-9), where *development* becomes a game of dominance between core countries which consider themselves developed, while poor countries in the South need help, e.g. through aid or intervention, to achieve the same level of industrialization and modernization. Therefore, the global South is integrated into global trade regimes while core countries continue to exploit them, thus keeping them underdeveloped (Chiriyankandath 2014:29-30; Crewe & Axelby 2013:8-9; Namkoong 1999:126). In this regard, underdevelopment becomes synonymous with dependence, while development is independence. Development was for a long time understood purely as economic development, and

due to the focus on trade in dependency theory, this focus persists. However, over time, development has become multidimensional, encompassing a range of social factors as well, e.g. tying development to empowerment (Crewe & Axelby 213:10-12).

Africa is widely used as an example of dependency patterns. They import capital and consumer goods, while exporting low-value products. While some scholars find it more relevant to look at e.g. India or China as core countries with regard to Africa, as these are now more exploitative than Europe (Kufakurinani 2017:67-69), the theory contains elements that are very useful in analyzing African independence and sovereignty (Ferraro 2008), which is the main focus of this thesis. Further, it is debatable whether the Western core has truly become less exploitative. Some scholars see aid conditionality as benefiting the states offering the aid, rather than the recipient states (Crewe & Axelby 2013:9). The Global Gateway Fund, which is a campaign for "boosting sustainable links around the world", aims to mobilize up to 300 billion euro in investments until 2027, but contains a long list of conditions based on the European Model, and the EU will be thoroughly involved in any project financed by the fund (European Commission 2021; Ricart & Iglesias 2022). Although it is difficult to assess who benefits more from this initiative, as it is very new, it could signify an attempt by Europe to rebrand themselves as development investors. Thereby, they may be able to coerce political elites (who accept the core countries' policies) to accept the aid with conditionalities, even if the solutions do not truly benefit the African people.

3.1 Conceptualization of *Power*

As mentioned, *power* is a key concept, here having several connotations. Due to the structural focus of dependency theory, and the agency-oriented focus of food sovereignty (elaborated upon below, in *Section 3.2*), I conceptualize power through this divide. In this regard, a structure is understood as both constraining and enabling agents (Dowding 2008). Capitalism and the liberal trade system enable states to gain economically from trade with other nations, but also determines that gaining economically is a prerequisite for development. Thus, this structure has the power to decide which states are dependent. For actors, power is understood as agency, meaning actors' ability to influence, control, decide, change, and exclude certain outcomes (ibid.), here both in the material

sense (control over resources) and the social-political sense (e.g. discursive influence or ability to decide political outcomes).

As *agency*, elements of power are understood in the following way: Control over resources means national and local control over products going into trade, i.e. not overtly influenced by demand from core countries, and also not dependent on capital inflow from Western states and corporations in order to produce. Second, having the political means to create regulatory mechanisms, either on a national or supranational level (e.g. in the African Union), and not having to rely on the regulatory policies of core countries is a strong element of agency. Also important is discursive power, i.e. the ability to influence public opinion, here understood as presence of civil society groups that are unique to the region, and are able to influence politics. However, dependency theory also focuses on local elites, meaning influential people and groups who are largely influenced by the core states. I will touch upon their impact in the second part of the analysis. In dealing with relations of dependency and food sovereignty, I therefore define power as *"the ability to exert agency in the development of the agricultural sector, both domestically and internationally, in order to enhance food sovereignty"*. Thus, food sovereignty becomes an important element of agency regarding the global relations of dependency that many sub-Saharan countries are stuck in.

3.2 *Food sovereignty* as independence

Food sovereignty may therefore also be understood as independence. While *food security* is based in a neoliberal framework, food *sovereignty* is a bottom-up approach which rejects liberalization (Lin 2017). There are several studies analyzing aspects of food *security*, while there are fewer focused on food *sovereignty*. The food sovereignty movement was created to withstand neoliberal trade policies commercializing food, as the movement wished to preserve both indigenous and rural agricultural practices tied to concepts of peasantry (Shilomboleni 2017; Pachón-Ariza 2013). Shilomboleni makes the case that while the Alliance for a Green Revolution in Africa is concerned with issues of food *security*, the Alliance for Food Sovereignty in Africa is, as the name suggests, concerned with issues of food *sovereignty*. The food sovereignty movement gained traction after a long period of trade liberalization and food aid in the 80s and 90s, which harmed domestic

production (Shilomboleni 2017). Thus, *food sovereignty* emerged as a guide to lead the African people out of relations of dependency related to food.

Food sovereignty contains key elements of agency, and thereby *power*, as it is defined as the right of peoples to decide their own agricultural and food policies, to increase domestic and local control over production, and to act in the agri-food trade regime in a way that benefits the people. In practice, this means that there is an emphasis on control over, and access to, resources, production modes, commercialization, and policies. One incredibly important aspect is control over seeds, as owning the property rights to seeds can lead to control over whole food systems. Multinational corporations like Monsanto are gaining prominence in sub-Saharan Africa and are pushing for uniform seed laws, which would mainly benefit them (Pachón-Ariza 2013; Shilomboleni 2017). Thus, while not always directly opposed to agri-food trade, there is a prioritization of local food production. However, the movement does reject both free trade agreements on food, and the power of corporations, particularly related to property rights, a point on which food *sovereignty* and food *security* differ markedly (ibid.). In short, *food sovereignty* aims at strengthening local and domestic communities so they can sustain themselves and withstand conflicts, disasters, and global trade fluctuations. Because of this, there are strong elements of independence, and although I will discuss the compatibility of *food sovereignty* and dependency theory, I find it a relevant subject to discuss in terms of dependency.

3.3 Critique of dependency theory

Dependency theorists have received a variety of critiques, particularly because the theory does not come from a unified school of thought. Mainly, the theory has been accused of being too homogenizing in the division of core and peripheral countries, using the nation state as a unit of analysis, not being substantiated by empirical evidence, and for being Eurocentric. Many critics find dependency theory out of touch with the contemporary, heterogenous world it seeks to analyze. The Eurocentrism that dependency theory is accused of harboring has to do with the theory's attachment to Western solutions, e.g. import-substitution, which made it impossible for the theory to predict or understand the success of, for example, the East Asian tigers (Singapore, Hong Kong, South Korea, and Taiwan). When dividing the world into a system of only two kinds of unit

(core/peripheral, developed/underdeveloped), a lot of nuance is lost; the theory has attempted to generalize the global economic system, and by doing so has lost sight of avenues of development which are not based upon Western industrialization and free market policies. Because of the global perspective, domestic factors and contexts are largely being ignored. With more liberal dependency theorists, there has also been a tendency to assume development based on a liberal foundation, i.e. development as control over resources and wealth, while still participating in global trade. The lack of unification means that the theory also consists of a lot of different positions which do not always fit together. There is a consensus about the historical nature of the world system, characterized by colonial powers which now keep a lot of countries in a state of underdevelopment, as Northern/Western states (the core) continue to exploit the global South (the periphery). However, apart from this, there is not a lot of agreement about what dependency concretely means. Therefore, there is no consensus regarding the nature of underdevelopment, and the different contexts within which underdevelopment occurs. Because underdevelopment and dependency often become synonymous, the theory has also been criticized for not providing an actual explanation of either concept (Dinesh; Jrank.org; Namkoong 1999:143).

However, in analyzing food sovereignty as an element of independence, the theory provides some of the basic tools of analysis, as the distinction between core and periphery, as well as the element of single commodity export, are quite easily understood in analyses. Further, GMOs are widely considered a Western product, and as the literature suggests, the commercialization of biotechnology, e.g. control by corporations and the patent system, means that there seems to be an ingrained pattern of dependency in GMOs, particularly as GMOs are a contested product group, subject to many neoliberal policies. Because *food sovereignty* can largely be understood as a bid for independence, the theory provides a strong framework for analysis of these phenomena. Further, in *Section 6*, I will discuss the usability, thus commenting on the validity of the theory.

4. Methodology and analytical strategy

In this section, I present both my methodology and my methods, and thereby my analytical strategy. In *Section 4.1* I present my ontological and epistemological choices, in *Section 4.2* I present my variables and how these measure food sovereignty and dependency. In *Section 4.3* I explain how I conduct my regression analyses. In *Section 4.4* I present a guideline for qualitative interpretation, and in *Section 4.5* I discuss the limitations of the chosen methods.

4.1 Philosophy of science

As mentioned in *Section 1.1,* the subquestions divide the analysis into two main parts and a section for discussion. This ties into the chosen ontology and epistemology, as I am working with a realistic ontology and relative epistemology, akin to critical realism. Ontologically, I believe reality as having depth, meaning that I am quantitatively assessing the apparent phenomenon, i.e. the interplay between GMOs, trade, and food sovereignty in sub-Saharan Africa, before qualitatively analyzing the underlying reasons for this phenomenon. The underlying reasons may be understood both as the overarching structure of capitalism, but also meso-level reasons like regional and domestic factors (e.g. culture and politics). Epistemological relativism in practice means that I am using the literature review as a foundation from which to build my own analysis and interpret my results. Further, it means that I recognize that the results I produce are not a finished truth which cannot be disputed – rather, it is the best explanation based on my choice of theory and analysis design and is therefore contextual. I use abductive reasoning, meaning that during the analysis, I am first looking at the apparent phenomenon, before attempting to find the reasons for its existence, i.e. a movement from "conclusion" to the conditions and premises that led to, or allowed, the conclusion (Buch-Hansen & Nielsen 2012:280-286, 304). Therefore, in the rest of this section, I will first explain the empirical field and how I measure and analyze food sovereignty, before explaining how I qualitatively assess the underlying reasons.

4.2 Measuring food sovereignty and dependency

There is no single measure of food sovereignty that is widely used and accepted as the standard. Surveys on perceived food sovereignty are popular, and may focus on e.g. availability of food products and decision making in food systems at a local level (First Nations Development Institute 2014). However, surveys like these measure food sovereignty at the microlevel. At the macrolevel (e.g. nationally and internationally), others have proposed using variables related to resources, commercialization, and civil society organizations (Ruiz-Almeida & Rivera-Ferre 2019). The framework of food sovereignty consists in part of a set of goals. Among these goals is freeing agriculture and food from trade agreements, thereby opposing the tenets of free trade in all sectors (Reardon & Pérez 2010). In this thesis, I have aimed to cover these elements through the chosen variables, as they both have to do with land use, trade in agricultural products, and civil society actors. In *Section 3.1* I conceptualized power, and in *Section 3.2* I described how food sovereignty can be seen as agency related to independence. In the table below, I explain the variables, and how they relate to dependency theory. All tables throughout the thesis are made by me, unless otherwise specified.

Table 3: Food sovereignty variables and dependence

Variables	Operational definition	Evidence of dependency
Agricultural export and import	Measures HS Foodstuffs, Vegetable products, and Animal and Vegetable Bi-products in billions of dollars.	High levels of agri-food trade will harm food sovereignty, and thereby dependency, as food sovereignty seeks to eliminate the inherent need for agri-food trade.
Agricultural value added	Measured as Export minus Import, i.e. amount earned from agri-food trade	Countries which do not earn from agri-food trade are net food importers, and therefore dependent on the global trade system for food.
AFSA and AGRA dummies	Measured as membership of, or being a focus country of, the organizations. Does not vary throughout years.	Elements of food sovereignty – AGRA mainly concerned with food *security* (tied to value added), with AFSA concerned with food *sovereignty*. Both measures of civil society.

Land use	Measured as hectares land use per capita, i.e. standardized measure of agricultural sector.	Countries with more per capita land use will be better suited for food sovereignty, and thereby less dependent.
GMO dummy	Binary measurement of countries that are actively using GMOs or have begun trials. Doesn't vary throughout years.	The implications for both food sovereignty and dependency are up for debate.
GDP, PPP	Gross Domestic Product per capita measured through Purchasing Power Parity, i.e. standardized measure of domestic wealth.	Countries with higher GDP per capita will be less dependent on international trade, and better equipped to become food sovereign.
Single commodity export	Biggest product measured as percentage of total trade. Symbolizes degree to which a country is a single commodity exporter.	Single commodity exporters are theoretically the most dependent.

The dataset (see *Appendix* 1) thus covers a range of variables within a framework of food sovereignty, meaning they can also be understood as elements of dependency. Eritrea, Cote d'Ivoire, Equatorial Guinea, and South Sudan have been excluded due to lacking data. I recognize the slight bias in this, but do not see it as an analytical issue. The trade data has been collected from the Observatory of Economic Complexity (OEC), where data is available up to 2020. For this reason, I have chosen to limit myself to 2010-2020. For Export and Import in agricultural products, I have chosen to exclude HS Animal products, as these are not subject to genetic modification yet. The chosen HS groups include e.g. tobacco, alcohol, spices, and tea, but do generally measure edible products (Simoes & Hidalgo 2011). Trade values below 1000 USD have been excluded due to being deemed inconsequential. Collecting data on GMOs in sub-Saharan Africa has proven difficult. Sources have different claims on adoption patterns and finding concrete years of adoption has been incredibly difficult. ABNE, the African Biosafety Network of Expertise, has an overview with information from most African countries, and I have therefore chosen to collect data from them. I have included countries that have commercial production and countries that are doing confined field testing (African Biosafety Network of Expertise B). In the overview, Eswatini is named 'Swaziland', meaning the data is from before 2018. The data on crops under research is taken from

a 2009 research article. Therefore, I recognize that the data is not entirely contemporary, and cannot be measured as time-series data.

Information about agriculture in the countries is measured as land use per capita, meaning the sum of cropland and land used for grazing livestock (Our World in Data). Our World in Data is a collaboration between researchers from the University of Oxford and the Global Change Data Lab organization, making it a trustworthy website. Because the data is only measured up until 2018, I have chosen to fill out the years of 2019 and 2020 with numbers predicted by myself based on the trend seen in previous years, meaning e.g. Nigeria will go down 0.01 ha each year, as they have done every year from 2010-2018. As measures of civil society action, I have first measured focus countries of the Alliance for a Green Revolution in Africa (AGRA), as stated on their website (Alliance for a Green Revolution in Africa A). Second, I have measured affiliation with the Alliance for Food Sovereignty in Africa as countries that are mentioned on their "core members" page (Alliance for Food Sovereignty in Africa A). Neither is measured as time-series data, as I could not find information on when these organizations began work in the different countries. Because of the regional reach of both the civil society organizations and the use of GMOs, I find it appropriate to conduct a region-wide analysis, including as many sub-Saharan countries as possible.

4.3 Regression analysis

I am technically working with panel data, as each variable is measured over time for all countries, giving me an n = 42 with 462 datapoints. However, because panel data regressions would not have been viable, as the dummy variables do not vary over time. I have therefore chosen to treat my data as randomized and conduct linear regression analyses. The measurable variables are chosen based on the conceptualization done in *Section 3.1*, but it is recognized that these do not explain the concepts in their entirety (Galderisi 2015:3). For this reason, I have aimed at using the state of the art to explore the concepts further, while also providing qualitative interpretations of the results. Linear regressions are used to test hypotheses that link variables at the interval level (Galderisi 2015:247). Because I am most interested in GMOs, but also in what affects food-related dependency (viewed as Value added from agricultural export), I have chosen to conduct two separate regressions. First, I create a binary response model with the GMO dummy as the dependent

variable, to see which other elements of food sovereignty most strongly affect the use of GMOs. This is an exploratory model, and I therefore have no hypothesis. Second, I create a regression model using the Value added variable as the dependent variable, to see which variables affect this. I expect the theoretical link between single commodity export and dependency to become evident, and I therefore use the hypothesis: *"Single commodity exporting countries are more likely to be net food importers"*. I am mainly looking at the R-Square as a goodness of fit measure, as well as the standardized coefficients, which show the strength and direction of correlations (Galderisi 2015:256, 262-263). The hypothesis can only be confirmed if the R-square is significant, and if the correlation is significant and in the correct direction.

4.4 Interpreting results through dependency theory

Thus, regression analyses are used to show trends and interactions between the chosen variables. This means that the first part of the analysis concerns the phenomena seen in sub-Saharan Africa regarding food sovereignty, GMOs, and patterns of dependency. The second part of the analysis begins with a categorization of cases, i.e. which countries are net food importers, single commodity exporters, and use GMOs. I then analyze the only two cases in which countries use GMOs and are both net food importers and single commodity exporters. This allows me to understand the dynamics of food sovereignty efforts, use of GMOs, and patterns of dependency. The evidence used for the qualitative assessment consists mainly of academic sources found through the literature search, African news sources, and sources related to food sovereignty (e.g. AFSA and AGRA). These are used as evidence of civil society and political goals, wishes, processes, and developments in the region. The OEC is used as evidence of trade relationships not specified through the measured variables, e.g. main export destinations and which commodities are mainly being exported. Using the African Union as a source of politics on the matter allows me to gain insight into the regional perspective, although I recognize that this risks losing sight of country-specific politics.

Because I understand *food sovereignty* as a concept that deals with power (in terms of agency) and dependency (as it deals with bottom-up, domestically specific development in agriculture), I am looking for evidence which either explicitly mentions food sovereignty, or which touch upon elements of food sovereignty. Sources which mention GMOs will be given weight, although GMOs

in this regard may also be understood as *new plant breeding techniques* or using biotechnology in agriculture. Thus, I aim to not limit myself to a singular understanding of GMOs, but rather to encompass all types of contested biotechnology in agriculture. By using mainly African sources, I aim to lessen Eurocentrism. Lastly, I focus on literature that provides explanations for the phenomena shown through the first part of the analysis.

4.5 Limitations of methods and data

The two-level analysis is thus meant to encompass both the "real phenomena" which become apparent through the statistical analysis, as well as the underlying reasons for these phenomena. I have included variables which figure into a dynamic of food sovereignty (e.g. land use, trade in agricultural products, and use of GMOs) as well as some measuring levels of dependency outside of food (single commodity export). The focus of this thesis is therefore on a single aspect of food sovereignty, which also ties into dependency through the focus on trade relations. Lastly, there are a range of factors that will inevitably have an impact on trade relationships and food sovereignty, e.g. more broad economic factors, factors related to climate, and health-related factors, that I have chosen not to include. These have been excluded as the regression analyses would otherwise have been too heavy and complicated.

As mentioned, all variables figure into a dynamic of food sovereignty. I do however recognize that food sovereignty in its activist conception also deals with farmers' rights and culturally appropriate crops. Many indicators of food sovereignty (e.g. food diversity or number of smallholder farms) have been excluded due to difficulty in obtaining quantifiable information about these aspects. To keep a regional-global perspective, I have prioritized the inclusion of as many sub-Saharan countries as possible, and therefore have only included variables that are measurable for most of the countries. Further, as mentioned in *Section 2*, there are many examples of academic articles dealing with local and national dynamics. Thus, the results of my analysis will instead provide a broad, regional perspective, which will in turn allow me to discuss the validity of dependency theory.

5. Food sovereignty and Dependency in sub-Saharan Africa

The analysis is conducted in two parts. In *Section 5.1*, I use statistics to gain insight into the phenomena of food sovereignty, dependency, and GMOs in sub-Saharan Africa. In *Section 5.2*, I analyze cases which are both statistically outstanding, yet have elements of representativeness.

5.1 Statistical assessment of food sovereignty, dependency, and GMOs

Before analyzing, I have excluded South Africa, as they are an extreme outlier (see Appendix 2:1). They are at the forefront of GMO adoption in Africa, and there have been several studies on them within this context. Reducing skewedness by excluding them therefore allows me to gain clearer insight into the phenomena in the remaining countries. To assess net food import and single commodity export, I have created dummy variables for the Value added and Commodity export variables. Net food import is 1 when countries have a value added below 0, while it is 0 for countries that have a positive value added. Single commodity export is 1 when countries score over 50% on commodity export, and 0 when countries score below. Thus, 1 = net food importer and single commodity exporter. The dummy versions of the variables are exclusively used for frequency descriptions and the case classification in *Section 5.2*, not the bar graphs or regressions. The descriptive statistics can be seen below:

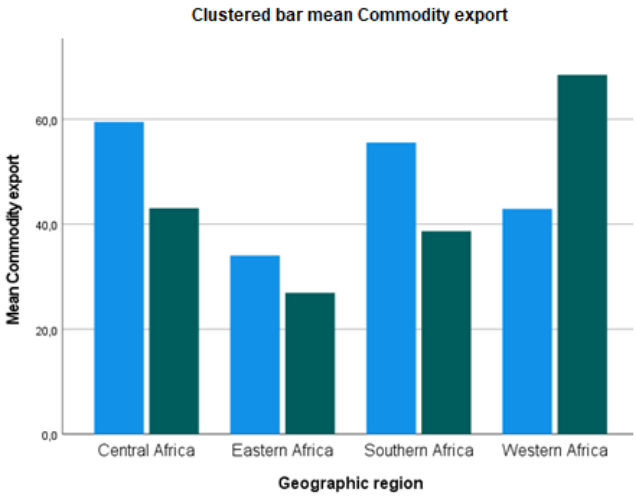
Table 4: Descriptive statistics for GMOs, net food import, and single commodity export

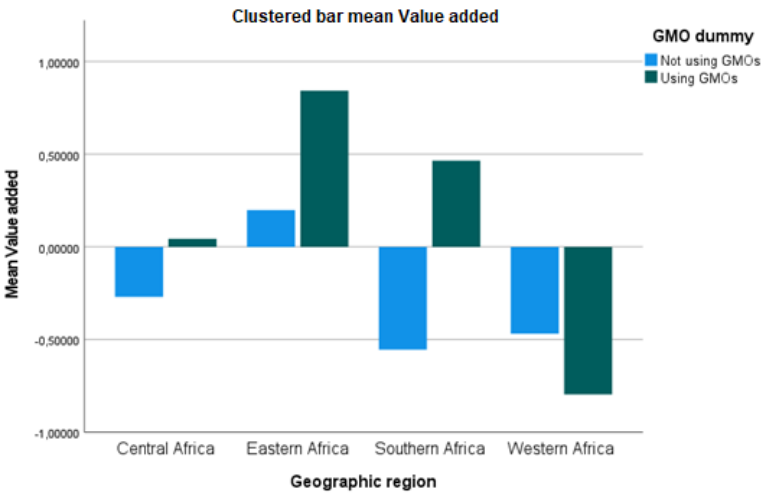
	GMO dummy	Net food import	Single commodity export
Frequency	88	317	165
Percentage	19.5%	70.3%	36.6%
Mean	0.20	0.7029	0.3659

(See Appendix 2:1-2)

These frequencies show that only 19.5% of sub-Saharan countries use GMOs, while 70.3% and 36.6% of observations measure as net food import and single commodity export, respectively. This means that many sub-Saharan countries are still stuck in patterns of dependency, particularly related to food. Grouping the observations further reveals that e.g. 79.9% of non-GMO using countries are net food importers, while the same is only true for 30.7% of GMO using countries. The

relationship between single commodity export and use of GMOs is more equal (Appendix 2:2-4). The relationships between the variables is visualized below:





(Disclaimer: Mauritania is grouped with Western Africa)

In all regions except Western Africa, non-GMO using countries are more prone to single commodity export. In Central Africa, non-GMO using countries are net food importers, while GMO using countries earn a small amount from agri-food trade. In Eastern Africa, countries are generally less prone to single commodity export than in all other regions. It is also the only region in which both non-GMO and GMO using countries earn from agri-food trade, although GMO using countries earn significantly more. In Southern Africa, GMO using countries are the only ones earning from agri-food trade, while non-GMO using countries are net food importers. In Western Africa, GMO using countries are the most prone to single commodity export in all of Africa, while they are also big net food importers, like all countries in the region. Testing the relationships between the chosen variables and use of GMOs is done through a binary response model:

Table 5: Binary response models for use of GMOs

	Model 1	Model 2	Model 3	Model 4
AFSA dummy	0.131***	0.126**	-	0.195***
AGRA dummy	0.148**	0.165***	-	0.415***
Commodity export	0.119**	-	0.128**	0.056
Agri-export	0.493***	0.439***	0.619***	-
Agri-import	0.049	0.096*	0.009	-
Value added	Excl.	Excl.	Excl.	-0.015
GDP, PPP	0.024	0.025	-0.014	0.076
Land use	-0.054	-0.050	-0.088*	-0.079
Adjusted R^2	0.421	0.410	0.393	0.233

Note: Table shows standardized coefficients. All models were significant in ANOVA table.
*$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

(See Appendix 2:4-9)

The Value added variable was excluded by SPSS as it directly correlates to Export and Import. The best fitting model explains 42.1% of the variation in use of GMOs. AGRA, AFSA, Commodity export and Export are all significant and have positive effects. Export has the highest standardized coefficient (0.493***) and can therefore be said to be the single best explanatory factor. This shows that there is no statistical evidence of a negative relationship between use of GMOs and trade. GMOs also do not seem to hinder civil society efforts in food sovereignty. Lastly, with commodity export, it seems that use of GMOs and patterns of dependency are at least not mutually exclusive. Testing the relationships between the chosen variables and Value added is done through regression models:

Table 6: Regression models for value added

	Model 1	Model 2	Model 3	Model 4
AFSA dummy	-0.011	-0.009	-	0.019
AGRA dummy	0.343***	0.349***	-	0.379***
Commodity export	-0.321***	-0.320***	-0.346***	-
GMO dummy	-	-0.015	0.129**	-0.040
GDP, PPP	0.061	0.062	-0.010	0.074
Land use	-0.035	-0.036	-0.047	-0.058
Adjusted R^2	0.226	0.225	0.136	0.125

Note: Table shows standardized coefficients. All models were significant in ANOVA table.

**p < 0.05 **p < 0.01 ***p < 0.001*

(See Appendix 2:9-13)

I have excluded Export and Import as they are directly correlated to Value added. AGRA and Commodity export are significant in all models they are part of. AGRA has a positive effect, while Commodity export has a negative effect. The push for a green revolution is thus shown to further at least food *security*, i.e. AGRA focus countries are less prone to net food import. Commodity export has a negative effect, which was expected. Therefore, we can confirm out hypothesis that *"Single commodity exporting countries are more likely to be net food importers".*

5.1.1 Conclusive remarks

So, in using statistical analysis, I understand that GMO using countries are generally less prone to single commodity export and net food import, except in Western Africa. Statistically, use of GMOs has a positive relationship with trade, civil society organizations, and commodity export, meaning GMOs do not harm exports nor progress in food sovereignty, and that use of GMOs and being in a state of dependency are not mutually exclusive. Value added is positively impacted by AGRA, meaning that the green revolution seems to further food *security*, at least. As expected, commodity export has a negative effect, allowing me to confirm my hypothesis that *"Single commodity exporting countries are more likely to be net food importers"*.

5.2 Outstanding cases and domestic explanations

In this section, I look at the interplay between GMOs, net food import, and single commodity export. A classification can be seen below. Because they fall into all three categories, Nigeria and Burkina Faso will be the focus of this part of the analysis.

Table 7: Classification of cases

GMOs	Cameroon, Ghana, Kenya, Malawi, Eswatini, Uganda
NetFood	Benin, Cape Verde, Gambia, Guinea, Lesotho, Liberia, Mauritania, Mozambique, Namibia, Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Togo, Zimbabwe, Central African Republic
SingleCom	Guinea-Bissau, Zambia
NetFood + SingleCom	Angola, Botswana, Burundi, Chad, Comoros, DRC, Congo Republic, Gabon, Mali
GMOs + NetFood + SingleCom	Burkina Faso, Nigeria
None	Ethiopia, Madagascar, Mauritius, Seychelles, Tanzania

(See Appendix 2:14-16)

Both Burkina Faso and Nigeria are West African countries. This means that they are part of the biggest region measured by number of states, and the region in which most states use GMOs, as established in *Section 5.1*. They are also the only region in which all countries are net food importers, even the GMO using ones. West Africa is, lastly, the region most prone to single commodity export. The single commodity export of Nigeria is composed of trade in petroleum, which accounts for 70.6% of exports and is exported mainly to European and Asian countries (16.5% of petroleum to India, 11.9% to Spain). Burkina Faso's single commodity export is composed of gold, which accounts for 88.2% of exports, and is exported almost exclusively to Switzerland (89.6% of gold) (Simoes & Hidalgo 2011).

Both the gold industry and the petroleum industry have had similar issues – insurgent attacks have been common in Nigeria, while terrorist attacks continue to be common in Burkina Faso. Both countries have also experienced a lot of internal power struggles, and issues facing the populations near production sites (e.g. displacement and problems with infrastructure). Burkina Faso was

formerly highly dependent on agriculture, but a political shift towards liberalization of the gold sector has amplified gold-dependency. This is, in part, due to private investors who are connected to political elites, and yet still conduct illegal mining and trade. Issues in Nigeria, where the petroleum industry is older, have led to an acceptance of violence against corporations and destruction of installations, particularly in the years between 2007-2009. After these insurgent attacks, the government created a presidential amnesty program, but issues with corruption and mismanagement, as well as cost, means the government is considering cutting it (Lanzano et al. 2011; Igwe 2020). Thus, dependency on (foreign) corporations may lead to conflict, thereby harming local communities. There also is a strong presence of domestic elites without concern for these local communities. Thus, the links between single commodity export and dependency are clear in both countries.

Oil production has made Nigeria the wealthiest country in Africa, but 60% of the population lives below the poverty line, and out of a population of 182 million people, 8.7 million people experience food *insecurity* in Northeastern Nigeria alone. In Burkina Faso, where 40% of the population live below the poverty line, 3.3. million people out of a population of 20.4 million are estimated to be experiencing acute food *insecurity*, particularly in the Sahel region where most armed conflicts are taking place (wfp.org A; wfp.org B). With food *security* as a standardized measure, it is therefore evident that even in a country that seems economically developed like Nigeria, many measures of development, e.g. related to food, are lacking entirely. Both AGRA and AFSA are therefore important; both countries are connected to AFSA and are focus countries of AGRA (Alliance for Food Sovereignty in Africa A; Alliance for a Green Revolution in Africa A). In Nigeria, agriculture is the single largest contributor to GDP growth, making it an important sector in the move away from a dependence on oil (Alliance for a Green Revolution in Africa 2019). In Burkina Faso, AGRA has aided in improving technological solutions for the ministry of agriculture, although these efforts are relatively new and may therefore not be impactful yet (Alliance for a Green Revolution in Africa B). The top-down perspective of AGRA is therefore evident, as there still is a focus on GDP growth and governance, not necessarily farmers and local populations' needs. However, it is clear that there is an effort to develop the agricultural sector in both countries.

The focus on development of agriculture is also found at the supranational level. The African Union has deemed 2022 the Year of Nutrition. There are several goals for all member states, e.g. linking

agriculture and nutrition, particularly as a safeguard for women and children. This considers the whole food system, which in turn requires systemic change (African Union). In short, there seems to be at least some social considerations, and an acknowledgement of the need for thorough changes. Similar initiatives are found with AFSA, who have organized e.g. meetings and policy labs between 2018-2021 with the aim to further a food policy shared between policy levels, from the AU to the local (Alliance for Food Sovereignty in Africa B). the AU food policy, which came after these efforts, does seem to include aspects more closely tied to food *sovereignty* than simply *security*. This could indicate a new paradigm in the AU, in which both elements of sovereignty and security are included in a harmonized food policy. Linking this to my data, although there are less focus countries of AGRA than there are members of AFSA, both organizations are present in many of the same countries. They have at times been direct opponents in public debates, but at the AU level, there seems to be a wish for them to coexist. although they differ markedly in many of their goals and policies, it might be possible to supranationally focus on both food *security* and food *sovereignty* simultaneously, thus finding a middle ground that is both structurally feasible and beneficial to the people of Africa.

However, attention must also be given to seed regulations and foreign corporations. Laws around agricultural resources (e.g. land and seeds) in Africa are largely coming from the US and the EU, either through corporate investment in the region, or through copying of foreign policies. Thus, even on the AU level, there is a lack of attention to indigenous wishes and farmers' rights, according to Alliance for Food Sovereignty in Africa and GRAIN (organization supporting small farmers) (AFSA & GRAIN 2015). According to Access to Seeds, Burkina Faso has seed policies and regulations in place, as well as their own certification agency, and a public institute for agricultural research. Out of 17 seed producing companies, two are headquartered in the country, and only five produce seeds in the country. For the two headquartered in the country, smallholder farmers produce 95% of the seeds. In Nigeria, the private sector is much more important, constituting 13% of seed release. While the country has biosafety laws (which promotes commercialization of GMOs), there are no laws protecting plant variety. Out of 24 companies in Nigeria, only six have production in Nigeria, out of which four involve smallholder farmers (Access to Seeds A; Access to Seeds B). Thus, there seems to be a bigger focus on commercialization in Nigeria, while regulation and smallholder farmers are important in Burkina Faso. The Access to Seeds Foundation is, like the Alliance for a Green

Revolution in Africa, financed by the Bill and Melinda Gates Foundation, and could therefore be understood as proponents of seed commercialization. As discovered through the literature review, privatization of seeds is a major issue. While Burkina Faso seems more capable of public seed regulation than Nigeria, private corporations like Monsanto are present in both countries. Because biosafety laws in Nigeria are designed to promote GMOs, Monsanto has gained prominence through the Nigerian biosafety agency, thus making the company an important elite actor in promotion and development of GMOs politically (Premium Times 2016). This has proven to be an issue in both countries.

Burkina Faso has halted production of Monsanto crops, in part due to the cost of buying seeds and chemicals from the company, according to Premium Times. The quality also become much worse, and as cotton is the second largest export commodity (after gold), the GM variant was abandoned only six years after it was introduced and took up three quarters of Burkina Faso's cotton production. The dependence on Monsanto is particularly worrying as their revenues in 2016 exceeded Burkina Faso's GDP (ibid.; Bavier 2017). Thus, some sub-Saharan countries end up depending on companies that are economically stronger than the countries themselves – the power imbalance is very clear. Monsanto has been criticized even by the Access to Seeds Foundation for its position on patents and plant variety protection laws, as none of these consider the needs of smallholder farmers. The company is also not very transparent regarding breeding programs and sales activities (Access to Seeds C), which make their activities unclear and further harm farmers.

While Monsanto has been a prominent actor in both countries, Nigeria has generally been more open to adoption of GMOs, while Burkina Faso has attempted to be precautionary. The countries have thus had different experiences with GMOs. Burkina Faso rejected Bt Cotton in 2015 (Gakpo 2018) after the aforementioned issues, while Nigeria is at the forefront of agricultural biotechnology in the Western region. They have e.g. recently approved the insect-resistant and drought-tolerant TELA maize, after already having adopted Bt cowpea and Bt cotton (Conrow 2021). In Burkina Faso, Bt cotton was commercialized in 2008, but the rejection of the crop led to a decrease in farmes' incomes and an increase in cost of e.g. pesticides and labor. However, they are now adopting Bt cowpea in a bid to strengthen the public's acceptance of GM crops and produce greater yields of the country's most important food crop (Gakpo 2018; Gakpo 2020). This means that even though there have been issues, there seems to be a wish to continue the adoption of GMOs.

In both countries, there are debates about the safety of GMOs, particularly related to biodiversity, as well as the mentioned concerns about corporations like Monsanto (Mojeed 2021). This mirrors what I found in *Section 2*, as there seems to be an acceptance of the technology but a lot of concerns around the regulation and privatization of the sector. Both Burkina Faso and Nigeria are among 13 African countries which have regulatory frameworks for biotechnology, and Nigeria has even included socio-economic considerations in their biosafety policy frameworks (although these policies have not gone into effect). The analysis done by Binimelis & Myhr (2016) reveals that Burkina Faso's regulations only include 4 out of 37 protection goals. Protection goals are meant to encompass all elements affected by adoption of GMOs, from the economical, over the environmental, to the social. While some sustainability and health-related goals are covered, there is a lack of goals related to food *sovereignty*, e.g. local autonomy and rights of indigenous peoples and communities (Travella et a. 2019; Binimelis & Myhr 2016). In Burkina Faso, the farmers surveyed in one study said they preferred the GM variant of Bt Cowpea to the traditional crop. Another study found that surveyed Bt Cotton farmers in Burkina Faso both experienced economic benefits, as well as far fewer cases of pesticide poisoning (Kyetere et al. 2019; Smyth 2017). This shows that studies focusing on these aspects can and should be conducted, in order for countries to create thorough regulatory frameworks which benefit both farmers and, more broadly, the country's citizens.

5.2.1 Conclusive remarks

Thus, from the literature and the first part of the analysis, I found that Burkina Faso and Nigeria are typical Western African cases. Both countries have experienced a lot of internal conflicts due to their dependence on single commodities, and while food sovereignty efforts exist, the agricultural sector is not at the forefront of politics, although both countries rely heavily on it. Experience with GMOs in both countries have been mixed, as the presence of Monsanto has led to negative experiences, while some farmers have experienced positive outcomes. Burkina Faso seems more aware of regulation than Nigeria, and debates about privatization persist in both countries, although more so in Nigeria. Efforts by the AU to increase food sovereignty are completely new, and the AU has generally not been capable of creating regulations and policies that consistently benefit local farmers. However, attention is now given to elements of food sovereignty not considered earlier, which may indicate a shifting paradigm.

6. Can food sovereignty in sub-Saharan Africa be understood through the lens of dependency?

Seeing food sovereignty as a bid for independence, both the concept and the empirical field can be linked to dependency theory. Although thought of mostly as a measure of food *security*, net food import is a relevant element of food sovereignty as well, and there is a clear link between single commodity export and net food import. This analysis was designed to be broad and encompass most countries in sub-Saharan Africa. In this sense, dependency theory functions well, as it is a macro-level theory. However, as critics have pointed out, many important elements of dependency (and food sovereignty as well) can only be assessed through micro-level analyses. Many such studies have been conducted, and while I am aware of the importance of more social aspects of food sovereignty, I have focused on a different element of food sovereignty which may be more easily tied to patterns of dependency, in the theoretical conception of the term.

In using the theory, I have therefore accepted some of the aspects which others have criticized. Because the theory understands *underdevelopment* as a consequence of resource exploitation by core countries, I have largely dealt with trade and economic factors, not social aspects of development. I also have only dealt with few aspects of the theory in understanding the analyzed phenomena, namely focusing on single commodity export and an abstract understanding of "patterns of dependency". I have in essence attempted to analyze the chosen subject within the confines of the theory. As for some of the common critiques of dependency theory, I have attempted to reduce Eurocentrism through the use of mainly African sources, I have attempted to substantiate my analysis with empirical evidence, and I have attempted to look beyond the nation state in understanding dependency, as there is a big focus on corporations in my thesis as well. During the second part of the analysis, I connected the statistical analysis and the literature with case-specific qualitative assessments, thereby linking food sovereignty and dependency.

In doing so, one thing has become clear; liberalization of single commodity sectors in Burkina Faso and Nigeria has led to issues with insurgent and terrorist attacks, and illegal trade. These issues have further weakened the country, thereby either worsening food sovereignty, or making progress towards it difficult. Similarly, the two countries have been influenced by Monsanto, as a key GM-

actor, in their GMO adoption processes. The lack of thorough regulatory frameworks in both countries have paved the way for multinational corporations to push for GMOs in a way which almost exclusively benefits the corporations. Thus, there is a recurring theme of dependency as a consequence of liberalization and commercialization from actors in the global North. Monsanto is an American company, while the gold exports of Burkina Faso go almost exclusively to one company in Switzerland. Although I have focused on two Western African countries, these issues are not specific to this region. As mentioned in *Section 2*, concerns about seed ownership, multinational corporations, and lacking regulatory frameworks are some of the biggest hurdles facing all sub-Saharan countries interested in adopting GMOs. Thus, some of the key issues common for both patterns of dependency and use of GMOs lie in the Western, capitalist neoliberal conception of the world economy. Thus, the true strength of dependency theory becomes the critique of neoliberalism, which aids in understanding how patterns of dependency, understood through single commodity export, may be replicated in GMO production in sub-Saharan Africa. While the exploitative power may have shifted from European countries to US companies, at least in the case of GMOs, all signs point to dependency being the main issue with integration of GMOs into e.g. the food sovereignty paradigm.

6.1 Reflections on project

As mentioned, some scholars feel that a better use for the theory now lies in researching the relationships between e.g. India/China and Africa, rather than the global North. Although I have just discussed why this may not be the case, it would be relevant in further research to look at concrete links between different countries and sub-Saharan Africa, for example through network analysis. Further, when talking about food sovereignty, perspectives from the people affected should be more highly regarded and used than what I am currently able to do. I have sought to include African sources. However, these are still English-language sources from organized groups, not information coming straight from local populations and farmers who are affected by these issues. It would be incredibly valuable to have included qualitative data from local communities and small-scale farmers if it had been possible.

7. Conclusion

Thus, in answering the question *How does use of GMOs figure into food sovereignty in sub-Saharan Africa, and what can this tell us about dependency in a theoretical context?* I have found that GMO using countries are generally less prone to single commodity export and net food import. The Alliance for a Green Revolution in Africa was shown to further food *security*, while single commodity export furthers net food import. There were no explicitly negative links between use of GMOs and trade, civil society organizations, or single commodity export. This means that fears about GMOs affecting trade are unfounded, and that both AFSA and AGRA can coexist with use of GMOs. Further, it shows that use of GMOs and relations of dependency are not mutually exclusive, which was further corroborated during the qualitative analysis of Burkina Faso and Nigeria. Here, I found that due to the role of multinational corporations like Monsanto in the adoption of GMOs in sub-Saharan Africa, relations of dependency may become even more apparent in GMO-using countries. The chosen cases are net food importers and single commodity exporters as well. In both cases, single commodity sectors were shown to be conflictual, e.g. leading to violent attacks and illegal trade, sometimes even by private investors who function as political elites. Single commodity sectors require a lot of resources and political focus, which may then halt progress towards food sovereignty. Lastly, the biggest strength of dependency theory is shown to be the critique of neoliberal policies. In the analysis, I found that privatization and commercialization have been issues both with single commodity sectors and GMOs, which indicates that foreign corporations' involvement in local production only furthers dependency and keeps countries from becoming food sovereign. Again, GMOs statistically have no negative relations with the measured aspects of food sovereignty and trade, thus indicating an overall positive impact for sub-Saharan countries. However, issues with foreign corporations and regulatory frameworks persist, and the issues posited by dependency theory are thus still relevant when looking at GMOs and food sovereignty in sub-Saharan Africa today.

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9. Appendices

- Appendix 1 – Dataset
- Appendix 2 – SPSS commands