Utrecht University

Master Thesis
- Master Sustainable Business and Innovation -

The democratic governance of technology in authoritarian regimes: genetic modification in Burkina Faso

22/09/2020

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Abstract

Democratic decision-making and public participation are key elements in any given context of public governance. This also holds true for the governance of technology, as new technologies can have far-reaching impacts on society which makes it desirable for the public to have influence on the decision-making. The current literature about the democratization of technology is based on countries where the overall governance is democratic, while little is known about the democratization of technology in countries with an authoritarian regime. Therefore, the aim of this research was to investigate whether and to which extent technologies can be governed democratically in authoritarian regimes. To answer this research question, the case study of the governance of genetic modification in Burkina Faso was used. The analysis in this research was based on the theoretical framework of Chilvers (2008). Semi-structured interview data of different stakeholders related to genetic modification in Burkina Faso was used for the analysis. The results showed that the democratization of genetic modification in Burkina Faso was hindered by a lack of representativeness and inclusivity, access to resources, transparency and accountability, independence, and efficiency. The limitations to democratic governance of the technology were related to the authoritarian nature of the Burkinabe regime in several ways. First, the government tries to control the media and information flows. Second, corruption is an issue. Third, political diversity is unaccepted. Most authoritarian regimes possess these characteristics to a certain extent and therefore, these characteristics form a barrier for democratic governance of technology in such regimes. This suggests that the governance of technology can only to a certain extent be democratized in authoritarian regimes. Future research can build upon this thesis to explore ways to overcome the identified barriers and to further democratize decision-making for technology in authoritarian regimes.

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1. Introduction

Democratic decision-making and public participation are key elements in any given context of public governance (Bovaird, 2005). Democratic decision-making means that citizens have influence on decision-making in a direct or indirect way (Held, 2006). Public participation refers to methods to give citizens influence in decision-making. The public interests are better reflected when the public has influence through a participation process and public participation helps to bring trust amongst different involved stakeholders as contact leads to sympathy for the perspectives and concerns of each other (Sismondo, 2010). Moreover, the public can offer a valuable contribution to decision-making. Decision-makers may have normative and social assumptions about the public. With public participation, factors of which decision-makers are less aware can be included in decision-making through a fair democratic process (Kraft, 1988; Fiorino, 1989).

Democratic decision-making is also important for the governance of new and emerging technologies. After all, new technologies can have far-reaching impacts on society which makes it desirable for the public to have influence on the decision-making. The public can be involved through the introduction of deliberative polls, juries consisting of citizens, and public deliberation days for example (Held, 2006). Research shows that different democratic decision-making tools for technology can provide decision-makers new knowledge about the threats and opportunities of technology that citizens perceive, and citizens new awareness and knowledge of the technology (Andersen & Jæger, 1999). Democratic governance helps evaluate the risks a technology brings (Kunreuther & Slovic, 1996; Levidow, 1994; McCallum & Santos, 1997).

Different studies on the democratic governance of technology exist. Some studies take a broad approach and investigate methods of public participation for technology decisions in different countries (e.g. Chopyak & Levesque, 2002; Joss, 1999). Other studies take a narrower approach. Einsiedel, Jelsøe and Breck (2001) for example focus on a specific public participation method for the technology of genetic modification in the food industry. However, most of these studies have in common that they are based on countries where the overall governance system is democratic. Little is known about how democratic governance of technology works in countries where the overall governance system is authoritarian.

There are reasons to suspect that an authoritarian regime disables democratic governance of technology. Democratic decision-making of technology can be a threat to the power of the rulers in an authoritarian regime as the power of the rulers will partly shift to the public. For this reason, it is unlikely the dictator will allow democratic decision-making of technology in the regime. But there are also reasons to suspect that an authoritarian regime does not necessarily have to disable democratic decision-making of technology. If the public does not accept the decision-making of the dictator for important technologies, public protests and rebellions can occur. This can be a threat to the power of the dictator, hence this can be a reason for the dictator to involve the public in decision-making. This raises the question whether and to which extent technologies can be governed democratically in authoritarian regimes. As illustrated, the answer to this question is still uncertain.

I will use the case study of democratic governance of genetic modification (GM) of crops in Burkina Faso to answer this question. Through GM, the genetic properties of crops can be changed by adding beneficial genes. GM is a typical example of an emerging technology that requires democratic governance, as is illustrated by the various public debates that have emerged over the development of GM over the past few decades. Proponents say that GM can be the solution to issues such as food scarcity, the effects of climate change on plants and animals, and human diseases (Andersen, 2020). Evidence suggests that GM already increased wealth for local farmers in different countries (Morse, Bennett, & Ismael, 2004; Pray et al., 2002; Qaim & Zilberman, 2003). Contrary to the beneficial effects, however, opponents claim that GM has various negative effects. Research suggests that species of GM crops can potentially harm the environment (Tsatsakis, 2017). More recent literature also shows that GM is not always economically beneficial for local farmers hence it can increase inequality, and that success is highly dependent on contextual factors (Cartel, Smale & Zambrano, 2006; Glover, 2010a, 2010b; Tripp, 2009).

As there is no clear answer on whether GM is beneficial or not and outcomes are situational, it is important to make well-informed and democratic decisions in the governance of GM. The fact that the effects of GM vary widely for different stakeholder groups makes democratic governance even more relevant. Hence it is no surprise that decision-makers in different democratic countries attempted to involve the public in decision-making for GM. Decision-makers in Denmark, Canada and Australia did this by organizing a consensus reference on the issue of food biotechnology (Einsiedel, Jelsøe & Breck, 2001) while decision-makers in France organized a public consultation to involve the public in decision-making for genetically modified vines (Joly & Rip, 2007).

In the current situation in countries in Africa, it is unclear if the public is involved in the decision-making for GM. Certain NGOs in Kenya for example have been very influential and able to give direction to decision-making on GM adoption (Harsh, 2014) while local farmers in Africa can be vulnerable to underrepresentation (Cohen & Paarlberg, 2004). Moreover, during the GM discussions in South-Africa, demonstrations and court cases took place and there has been engagement with legislators, bureaucrats and scientists (Scoones, 2008). However, the impact of these debates on decision-making has been limited, which illustrates that it is unclear how the public is involved and how the involvement contributes to decision-making for GM in Africa.

The involvement of the public in decision-making for GM in Africa has not been studied yet and has also not been studied in Burkina Faso. Burkina Faso is an African country with an authoritarian regime for decades. Moreover, Burkina Faso was one of the first countries in Africa to adopt the GM of crops, in 2008 (Dowd-Uribe & Schnurr, 2016), making it perhaps the clearest example of an authoritarian country that adopted GM. The decisions on GM in the past makes the case study interesting as the decision-making process for these decisions can be studied to find out whether and to which extent this technology can be governed democratically in authoritarian regimes.

To answer the research question, interview data of different stakeholders in Burkina Faso including farmers, representatives of the state, and representatives of the private sector were analyzed. Interviews were conducted in 2016 by a researcher from the University of Groningen and a local research assistant[1]. The interviews are focused on participation in the decision-making process for the introduction of GM. Answering the research question helps identifying weaknesses in current democratic decision-making of technology in authoritarian regimes. It sheds light on the conditions under which democratic forms of technology governance can work and further research can build upon the results to explore ways to strengthen democratic forms of technology governance, in particular in authoritarian regimes. As a result, the technology decision-making in authoritarian regimes can become more democratic which causes the interests of the public to be better reflected in decisions. Technology policies can be better targeted to different groups within the public, which may satisfy the needs of many individuals. A more democratic technology decision-making process also leads to mutual understanding between different groups within the public and to more awareness and knowledge of the technology.

Answering the research question is also scientifically relevant. It expands the literature regarding the democratization of technology and expanding this branch of science can give useful insights for the governance of technology. Currently, the democratization of technology is only studied in countries where the overall governance system is democratic and a knowledge gap exists on how the democratization of technology works in authoritarian regimes. This research fills this gap by identifying the conditions under which democratic forms of technology governance can be successful in these regimes.

In this chapter of the report, the topic and the research question are introduced. The second chapter consists of the theoretical framework. The third chapter describes the methods that were used in the research while the fourth chapter provides background information on Burkina Faso and the history of GM. The results are presented in the fifth chapter and are discussed in chapter six. This leads to the conclusion in the seventh chapter. This research ends with acknowledgements in the last chapter.

[1] The data collection was part of an ERA-NET funded project on the governance of agricultural biotechnology. My supervisor, Dr. Koen Beumer, was employed as a postdoctoral researcher on this project and was involved in preparing the data collection and writing up the results. The University of Groningen researcher, Caspar Roelofs, gladly shared his data for the purposes of this thesis. More details on how this data is dealt with will be discussed in the methodology section.

2. Theoretical framework

2.1. Democracy

The word 'democracy' has Greek origins. *Demos* means 'people' and *kratos* means 'rule'. This suggests that a democracy is a form of governance in which the 'the people rule'. In other words, a form of governance in which citizens influence decision-making in a direct or indirect way. The aim of a democratic community is to create political equality among citizens (Held, 2006). Democracy is one of the most legitimate forms of governance for the reason that it comes closest among the alternative forms of governance to values such as rightful authority, a fair moral compromise, and the common interest. Features that are commonly associated with democracies include fair and free elections, an open, accountable and responsive government, and the protection of civil and political rights and freedom by the government (Beetham & Weir, 2000).

Regimes of all different kinds profess to be democratic while these regimes often substantially differ from each other. Therefore, there is not one single accepted form of democracy. The political scientist David Held distinguishes nine different models of democracy in his classic book 'Models of Democracy' (2006), for example developmental democracy, protective democracy, and legal democracy. The majority of the nine models can be divided into two types: direct democracy and liberal democracy. A direct democracy is a system in which citizens are directly involved in decision-making. In contrast, liberal democracy is a form in which citizens are only indirectly involved. Here, citizens choose representatives that make decisions for them, with their interests and views in mind.

I based this research on the model of deliberative democracy. This form of direct democracy is often mentioned in relation to governance in technology decisions. Deliberative democratic thinkers replace democratic theory based on voting with democratic theory based on talking. It is a form of direct democracy in which public deliberation and equality are the most important aspects in decision-making (Bohman, 1998). Public deliberation is discussion between actors that involves testing arguments, critical listening, and earnest decision-making. It includes a problem analysis and evaluation, and a debate to identify the optimal solution (Carpini, Cook & Jacobs, 2004).

Different tools to increase public deliberation in modern democracies exist (Held, 2006). Examples are the introduction of deliberative polls, juries consisting of citizens, and public deliberation days. These tools to increase public deliberation are focused on public participation in decision-making. Public deliberation and public participation are terms that are similar to each other. The term 'public participation' in this research refers to attempts to make the public participate in decision-making to promote public deliberation. According to deliberative democratic thinkers, promoting public participation makes decision-making more democratic and therefore the effectiveness of public participation can indicate how democratic decision-making is.

2.2. Democracy and technology

Public participation for general governance can also be used to involve the public in decision-making for technology and can help democratize decision-making for technology. It has been widely accepted that democratic decision-making for technology has positive effects on the value of the technology that the public perceives and on the quality of science and technology (Burningham, 1998; Irwin, 2002). The public interests are better reflected when the public participates in decision-making. Additionally, public participation should help bring trust amongst all stakeholders as contact leads to sympathy for each other's perspectives and concerns (Sismondo, 2010).

I mentioned that the effectiveness of public participation can indicate how democratic technology decision-making is. As in line with the deliberative democratic approach I take in this research, a more effective participation process results in a more democratized decision-making process. The effectiveness of the public participation process in the case study of this research, the introduction of GM in Burkina Faso, is measured in this research. Getting an indication on the effectiveness of the participation process for the case study gives an indication to what extent the technology was governed democratically in Burkina Faso. This can lead to an answer of the research question whether and to which extent technologies can be governed democratically in authoritarian regimes.

The effectiveness of public participation is dependent on various contextual factors (Smith, Nell, & Prystupa, 1997). Public participation events that are considered to be more effective are for instance the implementation of focus groups, consultation exercises, and questionnaires, but in some cases these methods are not effective at all as contextual factors may hinder effectiveness (Rowe & Frewer, 2000). How the participation event is managed, who is invited, and the length of the event are all examples of contextual factors that influence effectiveness. Another example of a contextual factor that can affect the level of effectiveness is the way a questionnaire is conducted and implemented.

The framework of Chilvers (2008) can be used to measure the effectiveness of public participation processes as this framework takes different contextual factors into account that influence the effectiveness of public participation. The framework combines different studies that developed frameworks to define criteria of effective public participation (e.g. Rowe et al., 2005; Santos & Chess, 2003; Webler, Tuler & Krueger, 2001) and acknowledges where general agreement is emerging. I will use this framework to assess the effectiveness of the public participation process during the introduction of GM in Burkina Faso as this framework is for the reasons mentioned above most appropriate to use. The framework is currently only used for public participation for technology decision-making in countries with an overall democratic governance and therefore using it in the context of authoritarian regimes can give relevant insights.

According to Chilvers (2008), public participation processes are effective and democratic if they adhere to the following seven criteria:

- represent all the interested and affected stakeholder groups (representativeness and inclusivity);
- give all relevant stakeholder groups a chance to put forward their views in interaction with other involved stakeholders (fair deliberation);
- provide access to sufficient resources in the participation process, such as time, expertise and information (access to resources);
- be transparent to all involved in the process (transparency and accountability);
- support social learning of all involved groups (learning);
- be independent and neutral, to prevent bias (independence); and
- be timely and cost-efficient (efficiency).

Representativeness and inclusivity is the first criterion that Chilvers (2008) mentions in his framework. Stakeholder groups that are affected by the direct consequences of a new technology should be included in the participation process in order for it to be democratic. But there is also a group in society that is only affected by the indirect consequences that a new technology brings. John Dewey (1927) defines this group as the public. According to him, the public consists of those that are affected by the indirect consequences of transactions to an extent that it is deemed necessary to have those consequences cared for. So, when a group is affected by the indirect consequences a technology brings to an extent that it is necessary to take care of the consequences, this group should also be included in the public participation process. To make the process more effective, Chilvers (2008) mentions that the affected groups that should be included in the participation process should also be represented well. Groups are represented in the participation process when their values, beliefs and points of view are either directly or indirectly represented in the process.

Chilvers' (2008) second criterion, fair deliberation, relates to the importance of direct contact between actors within the participatory process. All involved should be allowed to elaborate their values, beliefs and points of view in a form of interactive deliberation. This creates mutual understanding and leads to collective decision-making and therefore positively affects the effectiveness of public participation. Examples of interactive participatory forms that can be used to establish fair deliberation are focus groups or other forms of direct discussion.

The third criterion of Chilvers' (2008) framework is access to resources and is based on the principle that the participatory process should not be hindered by a lack of resources as a lack of resources can hinder the effectiveness of public participation. When there is a lack of time for example, stakeholders cannot always elaborate all of their values and beliefs extensively enough. Another important resource is the access to experts such as scientists and decision analysts to support participants. Moreover, a lack of information available to stakeholders can lead to bias as they are not aware of all aspects and consequences of the technology (Rowe & Frewer, 2000).

This leads to the fourth criterion, transparency and accountability. There should be transparency to all those inside but also those outside of the participatory process about objectives and boundaries of the process because the wider public should also be able to see how decisions are made (Rowe & Frewer, 2000). Looking at accountability, there should be communication about how participatory in the process relates to the decision-making for the technology. It should be made clear beforehand if and how participatory influences the governance of the technology, and afterwards how the input influenced decision-making.

Chilvers (2008) also includes learning in the framework as the fifth criterion. According to Chilvers (2008), for public participation to be democratic, the public participation process can and should enhance social learning of all those involved. This means that participants should be able to learn about the values and beliefs of others, but also from the views of the experts. This can eventually affect the way participants see their private interests connected with the shared interests of their fellow citizens (Webler, 1995). Examples of ways to promote social learning are face-to-face small group work, repeated meetings over an extended period, and support of experts during the process.

The sixth criterion that Chilvers (2008) identifies is independence. Institutions might want to steer decision-making in certain directions which can cause bias. Therefore, the management of the participatory process should be independent and neutral. Independence can be obtained by letting neutral organizations manage the process (Crowfoot & Wondolleck, 1990). The participating representatives should also be independent and should not be connected to the institutions in any way. Any stakeholders with relationships to the institutions should be left out of the participating process. More independence in the public participation process leads to a more effective and democratic process.

Efficiency is the seventh and last criterion of the framework of Chilvers (2008) and can also influence the effectiveness of public participation and therefore hinder a democratic public participation process. Public participation has to be timely in the sense that stakeholders have to be involved as soon as is reasonably practical (Ng & Hamby, 1997; Middendorf & Busch, 1997). This makes participation most efficient and enhances credibility of the institutions (Rowe & Frewer, 2000). With GM for example, public participation is too late to be fully efficient when the public is involved in the process to decide which restrictions farmers should have when implementing GM. The public should be able to participate in an earlier stage of the process, to decide whether GM is going to be implemented in the first place.

Cost-efficiency is also included in the framework of Chilvers (2008) but this dimension of efficiency is left out of the analysis in this research. The quantitative data that is required for the cost analysis of participation methods is hard to obtain for the case study. Data about the costs of participation events for the introduction of GM in Burkina Faso is not publicly available and it is hard to identify and lay contact with those that have insight in this data. Still, the costs can be an important factor when organizing ways to involve the public and institutions that organize participation events want value for the money they invest (Crosby, Kelly & Schaefer 1986; Rahl 1996). For example, a major public discussion event seems inappropriate for a technology

decision with small impact. However, GM is a technology with impact on a national scale, making the value of even small investments in public participation methods worth the costs. Moreover, the scope of this research is focused on democracy in public participation processes. Due to practical reasons, cost-efficiency is relevant for the effectiveness of public participation, but it is to a lesser extent relevant in measuring how democratic public participation events are.

2.3. Authoritarian regimes

It is still unclear whether technologies can be governed democratically in authoritarian regimes, hence if public participation methods for technology decision-making can be effective in these regimes. On the one hand there are reasons to believe that democratic decision-making for technology is unlikely to succeed in authoritarian regimes. For example, rulers in authoritarian regimes can perceive the democratization of decision-making for technology as a threat to their power, and they are often reluctant in giving up on power. This can limit the chances of democratic governance for technology decisions to succeed in these regimes. On the other hand, however, there are reasons to suspect that an authoritarian regime does not necessarily have to disable democratic decision-making of technology. When the rulers do not involve the public in decision-making and the public does not accept the decisions that the rulers made, the public may organize protests against the power of the rulers. This, again, is a threat to the power of the rulers which is something that the rulers want to prevent. It can be a reason for the rulers to facilitate public participation in technology decision-making. As illustrated, it is still uncertain whether and to which extent technologies can be governed democratically in authoritarian regimes.

Different studies on public participation processes for the governance of technology exist. Some studies take a broad approach and investigate methods of public participation for technology decisions in different countries (e.g. Chopyak & Levesque, 2002; Joss, 1999). Other studies take a narrower approach. Einsiedel, Jelsøe and Breck (2001) for example focus on a specific public participation method for the technology of genetic modification in the food industry. However, most of these studies have in common that they are based on countries where the overall governance system is democratic. Little is known about the democratic governance of technology in countries where the overall governance system is authoritarian, and the effectiveness of public participation processes for technology in such regimes is not studied yet.

To emphasize this gap in the literature, I systematically analyzed the current state of literature. I searched in Web of Science for articles with topics related to the terms democratization or democratizing, technology, and public participation. This website for scientific articles showed me 64 records of articles related to these topics. I sorted the records by country to see in which countries these articles are based on. Thereafter, I compared the countries that the articles originated from with the overall democratic index score from 2019 that is created by The Economist Intelligence Unit (EIU, 2020). This score is based on five different main categories: electoral process and pluralism; the functioning of government; political participation; political culture; and civil liberties, and assesses the level of democracy of a country. According to EIU, a regime can be seen as authoritarian when the score of the country on the democratic index is below 4,00. I put these results in a table (see table 1) and what can be seen is that almost all articles that I found are based on a country where the overall governance system is democratic. Only 2 out of the 64 articles that were found in Web of Science scored below 4,00 and are based on countries where the overall governance is authoritarian, whereof 1 article is based on Russia and 1 article is based on China. This indicates a knowledge gap regarding the democratization of technology in authoritarian regimes. Moreover, the article that I found that is

based on Russia takes a quantitative approach and includes 32 different countries in the analysis (Makarovs & Achterberg, 2018) while the article based on China is focused on the influence of a new technology on authoritarian regimes instead of the democratic governance of technology in such regimes (Li, Lee & Li, 2016). A qualitative research on whether and to which extent technology can be governed democratically specified to authoritarian regimes lacks, and therefore I will take this approach in this research.

Table 1: The countries that the articles I found on Web of Science originated from, with the number of records on Web of Science and the democratic index score of the countries.

Country	Number of records	Democratic index score
United States	23	7,96
England	8	8,52
Spain	8	8,29
Netherlands	6	9,01
Brazil	4	6,86
Germany	4	8,68
Austria	3	8,29
Singapore	3	6,02
Australia	2	9,09
Belgium	2	7,64
Canada	2	9,22
Hungary	2	6,63
New Zealand	2	9,26
Portugal	2	8,03
Sweden	2	9,39
Bolivia	1	4,84
Croatia	1	6,57
Denmark	1	9,22
France	1	8,12
Ghana	1	6,63
Greece	1	7,43
Indonesia	1	6,48
Ireland	1	9,24
Kenya	1	5,18
China	**1**	**2,26**
Philippines	1	6,64
Russia	**1**	**3,11**
South-Africa	1	7,24
Switzerland	1	9,03
Wales	1	8,52

Just like democracies, authoritarian regimes can differ from each other a lot. Often there are differences in their institutional structure, their interconnectivity with the outside world and their political openness (Ezrow & Frantz, 2011). But there are some common features that scholars have identified. Authoritarian regimes are characterized by the fact that only a single ruler (a dictator) or a small group of rulers is in control (Huntington, 1993). Within an authoritarian regime, political diversity is to a certain level unacceptable and therefore political mobilization is limited (Linz, 1975). This means that the rulers often discourage citizens to express themselves and to politically oppose the rulers, which results in little political activity other than the politics of the rulers. Another characteristic of authoritarian regimes is that such regimes try to control the flow of media and political information to the public (Geddes & Zaller, 1989). By doing this, the political attitudes of their citizens can be shaped and influenced.

Political corruption is also a known characteristic of authoritarian regimes. Political corruption is defined as the abuse of public office for illegitimate private gain (Shleifer & Vishny, 1993). For example, political elites can use bribes to buy off electoral commissions so that they can manipulate public institutions. Political corruption can thrive well in authoritarian regimes and such regimes can even be more stable with corruption than without (Fjelde & Hegre, 2014). In some cases, however, dictators exercise strict control over corruption. The dictator is better in protecting the state from corruption when he has more political power. For that reason, corruption is stronger in countries with weak authoritarian regimes than in countries with strong authoritarian regimes (Amundsen, 1999).

3. Methods

I used qualitative research methods in this study to conduct the analysis, aimed to discover whether and to which extent technologies can be governed democratically in authoritarian regimes. This research used the governance process for the introduction of GM crops in Burkina Faso as a case study. Therefore, data of semi-structured interviews conducted with different stakeholders that were involved in the governance of GM in Burkina Faso was used. Using interview data of all stakeholders prevented bias as the point of view of every different stakeholder group was objectively taken into account in the analysis. Moreover, some stakeholders had useful insights about certain criteria from the framework of Chilvers (2008) that others did not have, and therefore using interview data of all stakeholders contributed to giving an explanation for each criterion. Who exactly the stakeholders are and why they were chosen is explained later in this chapter.

In analyzing the interview data, it was important to get to know how the participation process was perceived by the stakeholders. For example, the stakeholder groups should have had the impression that they were included in the participation process to fulfill the criterion "inclusivity". Interviews are a correct method to get to know these perceptions of stakeholders (Weiss, 1995). Additionally, the interviewers that are from Europe may have had a different perception of what is important in participation processes than the interviewees from Burkina Faso. The semi-structured format of conducting the interviews were most helpful for the case study as it gave the interviewees the freedom to come up with information that is important to them but what the interviewer may previously not have identified as relevant (Drever, 1995; Gill et al., 2008).

In total, the data of 25 semi-structured interviews was used for the analysis with a total of about 30 hours of audio data. The interviews were conducted in 2016 during the month of January in Burkina Faso by a researcher from the University of Groningen and a Burkinabe research assistant. This assistant joined because of his experience in the cotton sector in Burkina Faso and his knowledge of the political system. Moreover, about 30 percent of the interviewees did not speak English and the assistant functioned as a translator. The audio of a part of the interviews is in French. The audio files were transcribed and translated to prepare the data for analysis. In order to avoid the loss of certain subtle aspects of the information when translating the French audio files to English transcriptions, the translations were done with the help of computer software and were subsequently checked by someone who is proficient in both languages. Additionally, 16 more interviews were conducted without recorded audio. Each of these interviews have been summarized in a report by the University of Groningen researcher and these reports were also used for the analysis.

Civilians in authoritarian regimes are not always free to share their perspectives on politics and therefore participation in interviews can have ethical implications for the interviewees. Interviewees can be reluctant in sharing information because of these risks and this can cause bias in results. Anonymity was the outcome in the interviews used for this thesis as it protected interviewees from the risks. The interviewees gave permission to use their interview answers for the research conducted by the researcher from the University of Groningen and anonymity was

guaranteed which prevented bias in the data because the interviewees felt like they could speak freely.

To protect the interviewees from further risks, anonymity was also guaranteed in this research. Moreover, the interviewees did not explicitly give consent to use their answers for analysis in this thesis research, even though the research purposes of this thesis were in line with the original project of the researcher of the University of Groningen. Nevertheless, it was practically impossible to reach the interviewees through email and telephone given their situation in Africa which made it hard to explicitly ask them for consent to also use the interview data for the purposes of this thesis. This was another reason to guarantee anonymity. Still, certain interviewees were selected based on their position in the process of GM decision-making because this was relevant for this analysis. The interviewees included directors of certain organizations, for example. Even without mentioning their name in the analysis, they could have been identified because of their specific position. For that reason, their position was also kept as anonymous as possible. There may still be cases where doubt existed over whether anonymity was possible as well as in cases where anonymity was not requested by the interviewee and the specific position of the interviewee added value to the analysis. In those cases, the choice to refrain from anonymity in this thesis was discussed with the researcher from the University of Groningen, as he talked to the interviewees and was able to assess the risks more accurately. Depending on the advice of the researcher from the University of Groningen, organizations and firms were not mentioned by name but only broadly described in their context.

Interviewees were selected on basis of their relationship to the decision-making process. Most participants were selected beforehand and some were selected as a follow-up from previous interviews. People with different roles in the decision-making process were interviewed, so that every aspect in the participation process could have been taken into account in the analysis. To determine what participants played a role in the decision-making process, I first made a systematic overview of the decision-making process of the introduction of GM in Burkina Faso. I based this overview on extensive google search as well as on previous articles written on GM in Burkina Faso (e.g. Dowd-Uribe, 2011, 2014a; Roelofs, Swart & Beumer, 2020; Traoré, Héma & Traoré, 2014; Vitale et al., 2010; Zangré, 2009). The governance process of the introduction of GM is explained in the fourth chapter of this thesis, the background section. The interviewers also aimed to include interviewees with knowledge of the current and historical decision-making process regarding GM, with knowledge of the research and development process of GM, and with knowledge of the political and social context of GM in Burkina Faso. To cover all these aspects, the following actor groups were identified by them: the Burkinabe government, the largest cotton company of the country, the national cotton farmers' union, the national research institute of Burkina Faso, an international seed company that is owner of a specific type of GM cotton, researchers of universities, civil society actors, national and international biosafety institutions, farmers cultivating GM crops, and farmers cultivating conventional crops. At least two respondents per mentioned actor group were selected for the semi-structured interviews.

During the interviews, the interviewees were asked different questions regarding stakeholder participation in the decision-making process. The questions were related to the framework of

Chilvers (2008) and I was therefore able to identify how effective the public participation process for GM was. For example, researchers gave an indication of how transparent the information was that the decision-makers gave to participants during that participation process, and how independent the participation process was. Representatives of the government gave information about communication with the public, providing answers for the criteria accountability and efficiency. The interviewees were first asked about the perception on biotechnology and what GM means for the interviewees in general. Then, questions were asked about the history of introduction of GM crops in Burkina Faso and their perception of the decision-making process. After that, the interviewees were asked to tell about the development of GM after the introduction of it in Burkina Faso. Last, the role of the stakeholders in events and developments was discussed.

I analyzed the interviews through coding. I chose this method because the main message could be coded explicitly for the relevant variables in the framework from Chilvers (2008). For example, if an interviewee stated that there were no interactive forms of participation between actors, this message was labeled as "no interaction between actors". This label was later categorized as "low fair deliberation" as fair deliberation is a criterion of the framework of Chilvers (2008). Coding made the link between interview answers and the framework more clearly and this was key in giving an indication of effectiveness of the participation process and ultimately answering the research question. The computer software "NVivo" was used to conduct the process of coding. The interview data that was used for this research consisted of large quantities of textual data and using this software made it more convenient to organize codes and categories.

In the first step, the process of open coding, I analyzed the transcribed interviews line-by-line and I broke the sentences down into components (Khandkar, 2009). Relevant components were given a label to link it to a certain phenomenon. The data then consisted solely of labels. The step that followed was the step of axial coding (Khandkar, 2009). During this step, I categorized all labels so that the labels could be classified into the criteria from the theoretical framework. Categorizing helped conceptualize similarities and differences within the labels (Kendall, 1999). This was important for this research because this helped pointing out the similarities and differences of what interviewees said about the criteria that Chilvers (2008) describes in his framework. In the last step I examined the categories to explore interrelationships and patterns. For this thesis this meant that I identified the relationship between the different criteria from the framework of Chilvers (2008) for our case study and the characteristics of authoritarian regimes.

With the help of the coded data I was able to give an indication of how effective the public participation process was for GM in Burkina Faso. The effectiveness of public participation gave an indication of how democratic the process was. After knowing this, I interpreted the results of the case study in the context of authoritarian regimes in general. Interpreting these results gave an answer to the research question whether and to which extent technologies can be governed democratically in authoritarian regimes. Figure 1 shows the steps that were taken in the methodology which finally led to an answer to the research question.
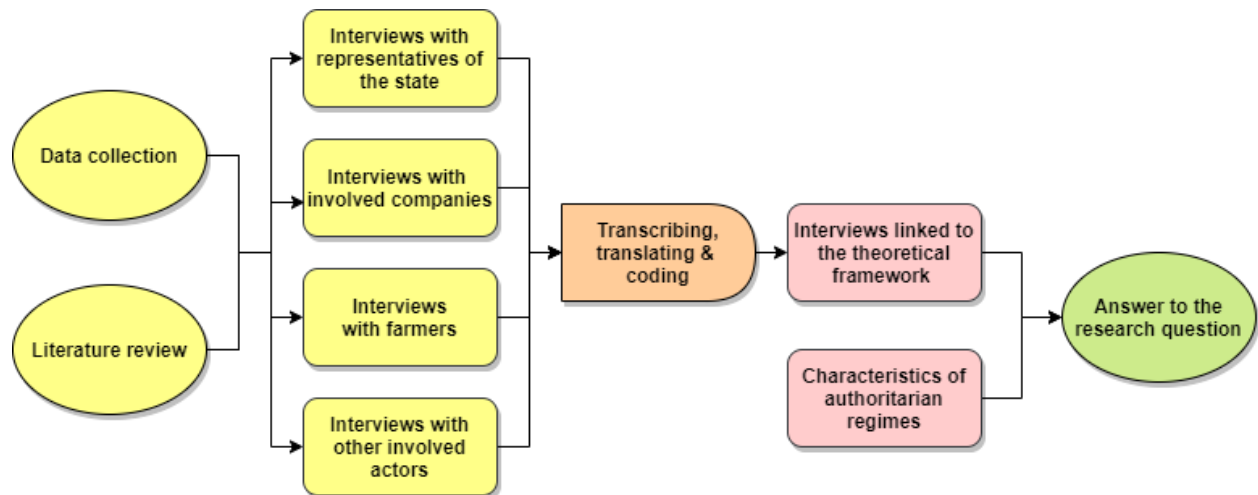
Figure 1: flowchart of the steps taken into the methodology.

4. Background

4.1. Burkina Faso

Burkina Faso is a land-locked country that belongs to the Sub-Saharan region (see figure 1) and is considered one of the poorest countries of the world. The Human Development Index indicates how well developed a country is and consists of factors as income, education and life expectancy. In 2018, Burkina Faso ranked 182th out of 189 countries indicating low human development (UNDP, 2019).

Figure 2: Map of Northern Africa with Burkina Faso highlighted (Google, n.d.).

During the period of colonization, the region that we call Burkina Faso nowadays was politically unstable. The French ruled from 1896 and during this regime the region was continuously partitioned and regrouped. These unstable politics had negative effects on the economy and export because the French imposed restrictions on local commercial activities that led to a lack of entrepreneurs and merchants. Moreover, the French made the agricultural sector switch to different types of crops for their commercial value rather than for use by the grower (Speirs, 1991). Cotton had high commercial value and this led to the fact that during colonization, cotton production began to dominate the agricultural sector. Burkina Faso was unified in 1947 and elections in 1959 resulted in the independence of Burkina Faso in 1960. The independence was brought to Burkina Faso by a president named Yameogo and led to presidential rule with a single party government as oppositions of the president were quickly suppressed (Speirs, 1991). Still the French influence remained notable long after independence.

After colonization the political landscape in Burkina Faso remained unstable because the government of Yameogo was overthrown by a military general in 1966. In the period between 1966 and 1983, four different military coups took place. In 1987, a coup took place which led to a period of 27 years in which president Compaoré and his political party ruled. He pursued a conservative approach to economic and social policies, using mainly coercion (Harsch, 2017). Critics of his regime were suppressed and punished. This is a typical feature for authoritarian regimes, because as mentioned in the theoretical framework political diversity is only to a certain level unacceptable in such regimes (Linz, 1975). Moreover, Compaoré manufactured pro-government vote margins so that he was able to retain his power. This can be seen as a form of political corruption which is also a characteristic of authoritarian regimes.

The regime of Compaoré lasted until 2014 (Frère & Englebert, 2015). According to the law it was time for the president to step up in 2015 as his last five-year term was going to end in this year. However, in 2014 he arranged a revision of this law so that he could stay president for a longer period of time. This led to public protests and rebellion and this pressure caused the president to resign. Another year of political uncertainty followed. At the end of 2015, a new president, Kaboré, was chosen by means of a general election. The main goal of Kaboré is to consolidate democracy in Burkina Faso (BBC, 2015). The new president however is one of the former architects of the regime of the previous president. Kaboré used to be president of the National Assembly and prime minister of the regime of Compaoré (Hagberg et al., 2018). According to many Burkinabe's the new ruling party is very similar to the previous one (Englebert, 2018). Whether the new regime is democratic is therefore questionable.

4.2. Cotton in Burkina Faso

The economy of Burkina Faso is heavily dependent on agriculture and almost 80 percent of the population is employed in this sector. The agricultural sector is still dominated by cotton production and cotton is mainly cultivated for export (World Bank, 2019). However, because of an increase in pests from around 1990 onwards, the cotton yields started to decrease. Farmers started using more and more pesticides at that time but the insects started to develop a resistance. The use of pesticides was not only expensive, but also unhealthy for the farmers and the cotton sector was in need of a solution for these problems. In this context, the introduction of genetically modified crops in Burkina Faso was mainly focused on genetically modified cotton which is called Bt cotton. This type of cotton is more resistant to insects and can therefore help controlling insect pests and reduce the need for insecticide sprays (Carriere et al., 2003; Cattaneo et al., 2006; Shelton, Zhao & Roush, 2002).

Different stakeholders are involved in the cotton sector. The group that cultivates cotton in Burkina Faso are the local cotton farmers. They are organized in a national organization called the National Union of Cotton Growers of Burkina (UNPCB). This organization was created in 1998 and consists of different sub-groups called Group of Producers of Cotton (GPC), each group with a chef representing a region (UNPCB, n.d.). The role of the organization is to represent the cotton farmers with respect to other actors in the cotton sector, to promote the

cultivation of cotton, and to take part in the management of the cotton sector as the cotton sector is partly owned by the UNPCB (Vitale, 2018).

The Burkinabe government is also involved in the governance of the cotton sector. They are responsible for cotton policies such as risk regulations and export tariffs. Moreover, the sector is also partly owned by the government (Vitale, 2018). This means that the government is also involved in the control and ownership of the cotton processing and marketing segments. Because of this, they are involved in decision-making within the cotton sector, for example on what crops to allow in the market, on what companies to collaborate with, and on price-setting mechanics. The ministry of agriculture plays a major role and is primarily responsible for cotton policies and decisions.

The Environmental Institute for Agricultural Research (INERA) is the national agricultural research organization of Burkina Faso and they are responsible for research regarding cotton (IPA, n.d.). About two-third of the agricultural researchers in the country are employed at this organization (Traoré, Traoré & Stads, 2014). The government works closely together with them and uses research results as a basis for policies. Universities in Burkina Faso also conduct research regarding cotton but they are not working together with the government as much as INERA does.

The cotton farmers sell their cotton to cotton companies in Burkina Faso and these companies are responsible for the sales and the marketing of the cotton on the global market. In return, the cotton companies supply the cotton farmers with all inputs that the farmers need to cultivate cotton. This includes the seeds that the farmers need because the cottonseed is entirely controlled by the cotton companies (Dowd-Uribe & Schnurr, 2016). This monopoly suggests that cotton farmers can only grow the seeds that the cotton companies provides them. There are three cotton companies currently operating in the country: Sofitex, Faso Cotton, and Socoma, and each company operates in a different region (Vitale, 2018). Sofitex is the largest cotton company and is in control over the Southern region which produces about 80% of the cotton in Burkina Faso (Dowd-Uribe, 2014b). Besides the government, Sofitex also has a saying in cotton policies according to Vitale (2018).

4.3. Bt cotton in Burkina Faso

The introduction of Bt cotton was initiated when in 1999, the American multinational corporation Monsanto was convinced to have a potential solution to the urgent conventional cotton problems in Burkina Faso (Zangré, 2009). Monsanto owned multiple GM technologies at that time and they had become active in pushing GM in numerous African countries. In response to that, the government of Burkina Faso invited them to host an information session. The government became more and more interested and hosted another meeting in 2000 (Zangré, 2009). They invited Monsanto to present Bt cotton to various stakeholders. Different ministerial departments, INERA, university researchers, Sofitex, civil society, and the UNPCB were invited to join this session. The session was mainly hosted to introduce GM cotton to the stakeholders, but also to discuss and promote it. After this introduction biotechnology became more of an

important topic and over the next couple of years, different workshops were organized to discuss the potential in Burkina Faso and to create awareness (Traoré, Héma & Traoré, 2014). For example, in 2001 a workshop took place where researchers from a Burkinabe university, researchers from INERA, and representatives of civil society had the chance to discuss the regulations on national biosafety (Zangré, 2009). Moreover, the former chef of the UNPCB stated in the interviews that in 2002, Monsanto and Syngenta, which are both seed companies, reached out to the UNPCB to talk about the conventional cotton issues the farmers are experiencing.

The support of the government grew and in 2003 the introduction of GM cotton made progress as in this year the government signed a contract with Monsanto to start the field trials. Monsanto assigned INERA, the national research institute of the country, to conduct the field trials for them and therefore they had the monopoly on research regarding Bt cotton. In the same year as when the trials started, a conference took place where the government of Burkina Faso and the American government met to discuss biotechnology. According to an interviewed member of an anti-GM organization, the reason that members of the government of the US were invited was because the Burkinabe government wanted to discuss the technology with a government that had experience with it. After all, Bt cotton came from a US company. The conclusion of the meeting was that Burkina Faso's aim is to introduce Bt cotton in the country. It is said by the same interviewee that Monsanto was also unofficially present at this conference.

Simultaneously a regulatory process was established to enable the introduction of Monsanto's Bt cotton. Burkina Faso has been member of the Convention on Biological Diversity (CBD) since 1993 and signed the Cartagena protocol in 2003 (CBD, n.d.). This protocol is an international agreement and aims to ensure the safe handling, transport and use of living modified organisms that results from biotechnology. The establishment of a national biosafety framework is a precondition for a country before any importation of GM organisms according to the agreements. As the government was already convinced that they wanted to introduce Bt cotton, a committee of scientists was appointed in 2003 to start writing legislation related to biotechnology and Bt cotton to prepare for the eventual introduction. The legislation was ready for adoption in 2004 and this was the reason for the government to host another meeting in June to present the work to ministers and high-level agricultural politicians of countries in West-Africa (Dowd-Uribe, 2011). Accordingly, the National Biosafety Agency (ANB) was established in 2005 to support the government in establishing functional biosafety regulatory systems. INERA provided them with the research results of the trials and in 2006 the legislation was officially accepted as a law in Burkina Faso (Traoré, Héma & Traoré, 2014). This also led to the approval to conduct numerous larger trials closer to the real operating conditions of cotton growers in 2007 (Vitale, Ouattarra & Vognan, 2011). These trials were more open to the public and according to an interviewed employee of the ANB, all sorts of different stakeholders were invited to study tours to visit these field trials.

While GM was getting more publicity, groups against GM started to become more active. Anti-GM demonstrations were first organized in 2004. In the same year farmers also expressed concerns regarding Bt cotton in a workshop organized by civil society (GRAIN, 2004). In 2006 a

social forum was hosted by an anti-GM organization according to a interviewed representative of the organization. The aim of both of these meetings was to inform stakeholders and to raise awareness for the potential harms of Bt cotton. They identified harms for the environment and suggested that Bt cotton seeds could become exclusive and too expensive. However, these movements did not significantly affect the introduction as after 5 years of testing in 2008, the ANB authorized the commercialization of Bt cotton and the government introduced the technology in Burkina Faso immediately after authorization (Vitale et al., 2010).

At that moment only one other country in Africa had commercialized GM crops on a substantial scale, namely South Africa. Egypt grew an amount of GM corn but on a significant smaller scale. This made Burkina Faso one of the frontrunners of GM in Africa (James, 2009). The first commercialized yields were encouraging and the share of smallholder farmers cultivating GM cotton grew (Dowd-Uribe, 2014a; Vitale et al., 2010). Four years after the introduction of GM cotton, in 2014, more than 70 percent of the cotton cultivated consisted of Bt cotton (ISAAA, 2016). This would suggest a successful implementation of the technology.

Nevertheless, in 2013 the farmers and other stakeholders started to notice disappointing Bt cotton quality. The length of the cotton fibers of Bt cotton were considerably shorter and this resulted in a reduction of the price of Burkina Faso's cotton which weakened the position of Burkina Faso in the global cotton market. The reason why the quality of Bt cotton was worse than that of conventional cotton was because seed companies conducted only a limited number of backcrossing's to include the Bt gene in the local Burkinabe cotton variety, which led to problems in the gene (Roelofs, Swart & Beumer, 2020). In the following years, several meetings and discussion sessions about the quality issues took place. INERA was doing research on the issue and was convinced that they could solve the fiber problem.

However, before a solution was proposed by INERA, the new president that was assigned in 2015, Kaboré, decided to stop with the production of Bt cotton in 2016 (Luna & Dowd-Uribe, 2020). All farmers had to switch back to conventional cotton. Besides the disappointing quality of Bt cotton, the political changes, the remaining conventional cotton regime, and the vertical organization of the cotton sector are considered as a driver for the sudden reverse (Roelofs, Swart & Beumer, 2020). First, the political changes from 2014 onwards, including the election of Kaboré, led to more political and economic ties to Europe and Bt cotton was originally a product of the US. This could have been a potential reason for Kaboré to stop with the production of Bt cotton. Second, the continued existence of the conventional cotton regime contributed to the sudden rejection of Bt cotton as Bt cotton was grown for only seven years and conventional cotton expertise was still widespread available, thus enabling the rapid return to conventional cotton. Third, the rapid reversal was facilitated by the vertical structure of the cotton sector because cotton company Sofitex produced and distributed all of the Bt cotton seeds and cotton farmers could only grow the seeds that the cotton company provides them, indicating that they had the final say in how much Bt cotton was grown (Dowd-Uribe & Schnurr, 2016).

5. Results

5.1. Representativeness and inclusivity

The first criterion for effective public participation that Chilvers (2008) mentions in his framework is representativeness and inclusivity. Stakeholders should be included in the participation process when they are affected by the direct consequences of possible outcomes of the participation process. But there is also a group that is only affected by the indirect consequences a new technology brings. Dewey (1927) defines this group as the public. This group should be included in the participation process when that person (or group of persons) is affected by the indirect consequences that a technology brings, to an extent that it is deemed necessary to have those consequences cared for. Not only should the mentioned groups be included in the participation process, their interests should also be represented well to make the process more effective. Groups are represented when their values, beliefs and points of view are represented in the process, either directly or indirectly. In the case of the technology of Bt cotton in Burkina Faso, there are many different groups that should be included and represented according to this definition.

The government and in particular the ministry of agriculture is affected by the direct consequences of the introduction of Bt cotton. The government is involved in the management of the cotton sector and responsible for cotton policies. The introduction of Bt cotton brings changes in the cotton sector which affects them. It means that the government has to react with decision-making and cotton policies accordingly. Therefore, the government should be included in the participation process.

The farmers of cotton in Burkina Faso are directly responsible for cotton production. Introducing Bt cotton in the country means that this group has to consider changing from conventional cotton to Bt cotton. If they choose to adopt Bt cotton, they have to slightly change the way of producing cotton. If they choose to stick to conventional cotton, they will continue to experience the issues of insects affecting their crops. Moreover, the introduction of Bt cotton can lead to changes in the selling price of cotton. Farmers are affected by the direct consequences of the introduction of Bt cotton and for that reason they should be included in the participation process.

Changes in the cotton crop, the cotton sector, and in the supply of cotton will directly affect cotton companies. Sofitex is the largest and most important cotton company by far. They are the ones that provide seeds and pesticides for the farmers. Moreover, the cotton companies buy the cotton product from the farmer. Cotton companies have to respond to the introduction of Bt cotton as changes in their stock of seeds and pesticides are required. Changes in the cotton product and the supply of cotton can impact their current way of buying and selling the cotton. Cotton companies should be included in the participation process because of these direct consequences.

Research institutes and universities should also be included in the participation process because they are affected by the direct consequences of the new technology. Agricultural departments are continuously doing research on for example performance and safety of crops. Especially INERA, the national research institute of Burkina Faso, is involved in research regarding cotton. A part of their role is to advice the government on agricultural policies. The introduction of Bt cotton gives all research organizations the job to research and assess the new technology.

Then there are companies that are responsible for bringing the Bt cotton seeds to Burkina Faso in the first place. In the case of Burkina Faso, these are foreign multinationals looking for market opportunities, with Monsanto playing a major role. They are the experts of the genetic modified cotton and the introduction of Bt cotton will affect their sales and their market strategy in the country. They should be included in the participation process as they are affected by the direct consequences of the introduction of Bt cotton.

The ANB has to make sure Burkina Faso complies with the rules of and legislation on genetic modification. The introduction of Bt cotton affects them as they have to audit the new legislation which gives them work to do. They are affected by the direct consequences of the introduction of Bt cotton and should be included in the participation process.

Civil society includes non-profit and non-governmental organizations that express the interests and values of their members and others based on the beliefs of the organization (World Bank, n.d.). Civil society organizations represent all civilians in Burkina Faso that are affected by the indirect consequences that Bt cotton brings. In the case of the introduction of Bt cotton in Burkina Faso, such organizations are for instance environmental action groups. Bt cotton can have an impact on the local environment in Burkina Faso. Environmental action groups want to preserve the local environment and they therefore have to look further into the impacts of Bt cotton and if necessary, take action. They have to take care of the indirect consequences of the introduction of Bt cotton. Another example of civil society groups that are affected by the indirect consequences of the introduction of Bt cotton in Burkina Faso are the anti-GM groups. The introduction of Bt cotton contradicts the interests of members of these groups. The organizations want to express the interests of their members well and should therefore take action. As illustrated, certain civil society organizations in Burkina Faso are affected by the indirect consequences that Bt cotton brings to an extent that it is deemed necessary to have those consequences cared for and therefore they have to be included in the participation process.

We have seen that the government, cotton farmers, cotton companies, research institutes and universities, seed companies, the ANB, and civil society should be included in the participation process. To make the participation process more effective, their interests should also be represented well through direct or indirect representation. Looking at the introduction of Bt cotton through this lens, several actors were of the opinion that representativeness and inclusion was generally achieved for all relevant actors. For example, a representative of Monsanto stated: "Yes, every important stakeholder was represented at the first big introduction

meeting of Bt cotton in Burkina Faso for sure". Moreover, a former employee of INERA and an inspector of the ANB both stated that all interested stakeholders were involved in the study tours to the field trials in 2007. This would suggest that every relevant stakeholder was included in the participation process and that the values and beliefs of every stakeholder were represented in at least two different participation events.

However, it is important to look more closely to the different stakeholders that should be involved. The government was directly represented in the participation process. Government officials participated in different meetings regarding Bt cotton, representing their values and beliefs. According to a researcher of a university in Burkina Faso, the government was the host of the meeting in 2000 where Monsanto introduced Bt cotton to stakeholders and according to an employee of the ANB, also of the study tours to field trial locations in 2007. Moreover, the government organized meetings with governments of other countries, including the US and other countries in West-Africa. They were also involved in the establishment of a national biosafety framework.

Sofitex, INERA and Monsanto, and civil society were also directly involved in multiple events. Besides the first introduction meeting for Bt cotton in the country in 2000 and the study tours to the field trials, the stakeholders were also invited at meetings to discuss the quality issues of Bt cotton. Moreover, they were included in sessions to discuss where exactly to do research on before even initiating the first field trials. Out of these three stakeholders, INERA was included in even more events. They were the ones that were appointed to be responsible for the research regarding Bt cotton and were also involved in the writing of legislation for the national biosafety framework. This was also the reason for the government to invite INERA to the meeting to present the work on legislation to politicians of countries in West-Africa.

Here, the universities are left out of the participation process. Universities were directly included at the first introduction meeting in 2000 and several other meetings according to an employee from a university in Burkina Faso, but in contrast to INERA they were not involved in writing the new legislation. When this same interviewee was asked if the government should have made more efforts to include all stakeholders, the interviewee resolutely said "Yes.". This indicates that the representative of the university experienced not enough inclusivity in the participation process. Moreover, a director of an anti-GM organization stated: "You know, the university has been sidelined and still is sidelined. All these questions there. It was the Ministry of the Environment that organized all of this (research)". The involvement of the ANB is similar to that of the universities. They were included several other political meetings and discussion sessions according to an employee of the ANB, but involvement in substantive research meetings lacked. Since their establishment in 2005, their main purpose was to give the government authorization for the introduction of Bt cotton.

The cotton farmers in Burkina Faso are also to a lesser extent included in the participation process. The UNPCB, the national organization of cotton producers, is supposed to represent their interests in the process. It is true that the UNPCB is included in different important events regarding the introduction of Bt cotton as different stakeholders verify this. The leader of the

UNPCB was included at the first introduction meeting in 2000, at the study tours at the field trials, and even in writing the legislation framework for Bt cotton. If the leader of the UNPCB would convincingly represent and protect the interests of all the cotton farmers, this form of indirect representation would benefit the effectiveness of the participation process. However, most interviewees question whether this is the case. An employee of Sofitex, members of different civil society organizations, a former worker of the UNPCB, an employee of Monsanto, and most important, all interviewed farmers believe that the UNPCB did not represent the farmers' interests. One of the farmers illustrated their view on the UNPCB by stating: "They (the UNPCB) do not defend our interests. There is nothing we can show you and say that it is the union that helped us. The only thing that the union does is take our money, which is 25% of our cotton selling price". This story is confirmed by the fact that the former UNPCB leader was put into prison in 2015 because of corruption and financial mismanagement of the UNPCB (Bancé, 2015). The farmers are aware that they were not able to express their concerns and beliefs themselves and that the only way to do that was via the UNPCB. INERA illustrates this by stating that they could not get directly into contact with farmers when doing research on Bt cotton. Moreover, the only moment when farmers were directly included in the participation process was when a selected group of farmers was invited to study tours to field trial locations, in 2007. However, the impact of this event was not significant and included a limited number of farmers. For these reasons, the farmers are not included and represented in the participation process very well.

For the participation process to be successful, all relevant stakeholders should be involved and should be represented well, either directly or indirectly. The government, cotton farmers, cotton companies, research institutes, universities, cotton seed companies, the ANB, and civil society are identified as relevant stakeholders. Out of these stakeholders, the government, cotton companies, the national research institute, cotton seed companies, and civil society groups are included in multiple important participation events and are directly represented. Universities in Burkina Faso and the ANB are to a lesser extent included in the process. They are included and directly represented at important meetings such as the introduction meeting in 2000, but involvement in meetings regarding essential research lacks while these groups have the expertise and can offer a valuable contribution to research. Cotton farmers experienced almost no inclusivity at all. The UNPCB is included in key events and is supposed to indirectly represent the interests of the farmers. However, this organization fails to do so and because of this the farmers' opinion is not taken into account in decision-making.

5.2. Fair deliberation

The second criterion that enhances effective public participation according to Chilvers (2008) is fair deliberation. Deliberation refers to discussion between actors that involves testing arguments and critical listening. It is considered to be fair within the participation process when all stakeholders were given a chance to put forward their points of view with other stakeholders in an interactive format. Direct contact between stakeholders is key here because it can ultimately lead to collective decision-making and this improves fair deliberation. Not every public

participation event gives the participants room for interaction. Therefore, forms of direct discussions such as focus groups stimulate fair deliberation.

Of the different actors that should be involved in the deliberations, both government officials, Sofitex, INERA, university researchers, the UNPCB, Monsanto, the ANB, and civil society indeed had various opportunities to exchange their arguments and express their beliefs and values. For example, according to an employee of a university in Burkina Faso and an employee of INERA, the first introduction meeting in 2000 where most stakeholders were present as we saw in the previous section consisted partly of a two-group discussion session. Monsanto gave a presentation at the start of the meeting to introduce Bt cotton and after that the group of participants were divided into two groups. In both groups, discussions were started and the different groups discussed different themes related to genetic modification and Bt cotton. After the first discussion session the groups switched from place and the stakeholders were given the opportunity to discuss the other thematic with each other.

During the field trials, there has also been direct contact between stakeholders. Study tours were organized to the trial locations in 2007 and according to an employee of the ANB the purpose of these tours was: "...to discuss the technology with farmers, members of parliaments, consumers groups, all kinds of groups you can imagine in the Burkina society, media people". There definitely was direct interaction between stakeholders during these meetings. The stakeholders that were directly included in the participation process had a chance to put forward their points of view with other stakeholders in an interactive format, which suggests that stakeholders had access to fair deliberation.

The cotton companies in Burkina Faso and the UNPCB established an organization in 2006 to enhance contact between each other. The organization is called the Inter-professional Association of Cotton Producers of Burkina Faso (AICB) (UNPCB, 2012). This organization created even more direct interaction between these key stakeholders and it provides another way to learn from the values and beliefs of each other. Within the AICB, decisions are made regarding cotton seeds and pesticides, cotton research programs, and the management of the cotton sector (Sofitex, n.d.). An employee of the AICB stated: "Decision making within the AICB is based on strong arguments", illustrating the level of direct discussions and fair deliberation between these stakeholders.

More important, however, is that an employee of the ANB thinks that different discussions with direct contact between stakeholders, including the first meeting in 2000 and the study tours in the field trials in 2007, were mainly organized to improve communication between all actors and not to directly include them in decision-making. The events did not result in collective decision-making and issues raised during the discussions did not affect decision-making. Moreover, within AICB there is direct contact between stakeholders and this does create mutual understanding, but the discussions did not lead to collective decision-making on national scale regarding Bt cotton. An interviewed expert of cotton in Burkina Faso backs this up by stating the following about this issue: "The final decision to introduce Bt was also only made by the minister

of agriculture and some other people high up in the cotton sector". Therefore, fair deliberation increased the effectiveness of the public participation process only to a limited extent.

In addition to that, cotton farmers were excluded from fair deliberation. A farmer said in one of the interviews: "For the introduction of Bt, there were no meetings with us". One of the only ways for the farmers to express their concerns was to have discussions within the UNPCB. The other stakeholders only dialogue with the UNPCB and not directly with the farmers. According to an employee of the ANB, another way for farmers to exchange arguments was via the AICB. The AICB organized meetings with the UNPCB and regularly sent a report with concerns of the farmers to the government. However, this is not a form of direct interaction from the farmers with the other stakeholders, the farmers again had to communicate via UNPCB. This means that the farmers were not able to learn about the points of view from others. Moreover, an employee of INERA mentioned that the media had interviewed farmers and that researchers had to learn about the values and beliefs of the farmers via television because they could not directly access the farmers. This means that the researchers could only to a limited extent take the points of view from the farmers into consideration in the field trials and in research. The only moment when farmers had the chance to have direct interaction with other stakeholders was during the study tours at trial locations in 2007, but only a small number of farmers were involved in these events and the direct contact with stakeholders came too late in the participation process to be effective. The lack in direct communication could have caused a lack in mutual understanding.

Direct contact between all stakeholders is a dealbreaker when considering deliberation to be fair and in the case of the introduction of Bt cotton in Burkina Faso, the government, Sofitex, INERA, university researchers, the UNPCB, Monsanto, the ANB, and civil society had the chance to have direct contact with other participants. Direct contact was included in different discussion sessions and during the field trials. The direct contact between stakeholders stimulated effective public participation but these forms of direct contact did not directly lead to collective decision-making. The direct contact between the stakeholders mentioned above therefore only improved the effectiveness of the public participation process to a limited extent. Moreover, most farmers did not have access to direct contact with other stakeholders. Only a small number of farmers was invited to one event that allowed direct discussion and other farmers were not able to express themselves and to listen to others at all. This resulted in the fact that other stakeholders were unaware of the values and beliefs of the farmers and that farmers could not discuss contradicting values and beliefs. This led to a less effective participation process because the beliefs of the farmers could not have been taken into account in decision-making.

5.3. Access to resources

Chilvers (2008) defines access to resources as the third criterion in his framework. For the public participation to be effective, the process should not be hindered by a lack of any resources. Time is an example of a resource that can hinder the participation process when there is a shortage of it. If a participation session is too short and stakeholders do not get the time to elaborate their beliefs, the effectiveness of the process is affected. Other forms of

resources are the access to experts and the access to correct information that stakeholders should have. A lack of information can lead to misperception of the technology by the participants and this can lead to biased beliefs and values. It is also possible that a stakeholder was invited to a participation event but that this stakeholder had no means to travel to the event which hindered the person from participating. This lack of access to transportation would lead to the fact that the stakeholder was not able to express their points of view at all.

Not a single interviewee mentioned that there was a lack of time or a lack of access to transport during participation events. We know that during discussion sessions, included stakeholders had the chance to elaborate their points of view so there is no evidence that suggests that participants were hindered because of limited time or because they did not have access to transportation. This suggests that time and transportation did not play a major role during participation events for the introduction of Bt cotton, however, we do not know for certain as there is no evidence that indicates how time and transport influenced the participation process.

Stakeholders did have access to various forms of experts during the participation process. An expert is defined as one who has knowledge derived from extensive experience with subdomains (Hoffman, 1998). In the context of this research, someone is defined as an expert when this person has knowledge from the subdomain of cotton and genetically modified cotton. According to an employee from the ANB, the scientists of ANB mainly functioned as support to all stakeholders including farmers. He stated: "... and this is why ANB in its program had to go everywhere in Burkina Faso to organize local meetings with all the stakeholders to try to inform them". Another scientist from ANB confirms this in a different interview by saying that a large part of what ANB did was pointing out which information about Bt cotton the stakeholders previously received was true and which was false. Scientists at the ANB have extensive experience with Bt cotton and the legislation of this technology and can therefore be considered as experts. The AICB had more or less the same role as the ANB and organized meetings with different stakeholders to discuss Bt cotton, including the technical aspects of the new technology. An employee of Monsanto believes that cotton companies, research institutes, the UNPCB, and Monsanto were included in these AICB meetings. The research institutes that were present, INERA and researchers from universities, have experience with cotton and Bt cotton and conducted research on the crop for years, which makes them experts. Their scientists gave their technical opinion on Bt cotton and answered any questions that participants had, according to an employee of UNPCB. This evidence suggests that there was no lack of access to experts.

Still, a scientist from a university in Burkina Faso is convinced that scientists are not always accepted as experts by different stakeholders in the country. He said that if a scientist starts to advocate the benefits of GM, the public might think that the scientist is just a defender of the government and that his judgment is mainly political. This can hinder effectiveness as stakeholders might not always be open to receive support from experts.

Stakeholders and in particular farmers were in need of access to correct information during the introduction of Bt cotton, mentioned a representative of an anti-GM organization in the

interviews. GM is relatively new and before the introduction of Bt cotton, stakeholders had very little knowledge of the technology. Their perception of the technology relied on information that they received from others. A proportion of the population of Burkina Faso is illiterate which causes their foreknowledge regarding GM to be even less. An employee of a university in Burkina Faso illustrates this by stating: "If you take the proportion of our population that is illiterate and you ask them what is GM, they will not know what is GM". Moreover, according to a scientist from ANB, in the beginning the farmers had a lot of misperceptions on Bt cotton.

During interviews, different farmers were asked how they received information regarding Bt cotton during the process. Many farmers got their information via Cotton Technical Agents (ATC). These are employees of Sofitex and had contact with farmers. Different interviewees pointed out, however, that these technical agents mainly gave information about the benefits Bt cotton has. A farmer stated: "We heard that Bt is a cotton that does not need a lot of fertilizer. We had this information from Sofitex agents and other producers. After trying it ourselves, we found that some of this information was not entirely true". This indicates that Sofitex only provided the information they wanted to share, which is in this case information that benefits the sales of the expensive Bt cotton seeds. It resulted in the fact that the information that farmers received from the ATC's was not entirely objective and correct. Other than the sharing information about the benefits of Bt cotton, Sofitex mainly contacts farmers to inform them about payment information or to inform them about decisions that they made, as another farmer said: "All the information they (Sofitex) give us is given in the form of a decision and we are obliged to follow".

The largest share of information that the farmers received was shared via the UNPCB and from farmer to farmer. The interviewed farmers mentioned that the UNPCB hosts information forums for farmers twice a year that provides information about all sorts of aspects of cotton including information about Bt cotton. Beside these events, cotton farmers that live in the same village often discussed the new technology of Bt cotton with each other face-to-face. Still the farmers were sometimes misinformed and the information that the farmers shared with each other was not always true. There were sometimes false rumors going around that increased fear for the technology. An example of a rumor mentioned by an interviewed farmer is: "...if the animals eat the leaves of Bt they die, and that Bt cotton is not good for the land because it depletes the soil". Even after introduction of Bt cotton, some farmers still think that the technology can have a negative impact on human health. All of this misinformation could have affected the way farmers perceived the consequences of the new technology. This lack of access to resources likely influenced the way the farmers shaped their values and beliefs regarding Bt cotton and affects the participation process.

For the government, Sofitex, INERA, university researchers, the UNPCB, Monsanto, the ANB, and civil society groups, the first Bt cotton introduction meeting in 2000 provided a lot of general information. However, not all stakeholders believe that this meeting provided enough information to cover the need of information regarding the introduction of Bt cotton. A scientist from a university stated: "...because the government was mostly working to introduce this BT cotton without any advertising or without any debate and information for the population". This

indicates that stakeholders expected the government to inform other stakeholders and that they failed to do so. In addition, it is believed that civil society groups, in particular anti-GM activists, were spreading incorrect information to other stakeholders. An interviewed anti-GM activist thinks that his organization was critical and raised awareness about the BT harms during the participation process. Other interviewees experienced that differently, as an employee of ANB mentioned: "...because the activists have done a really good job in misinforming people". It is also believed by a scientist of a university that at every stakeholder meeting, civil society was trying to show only bad sides of GM, sometimes with little scientific evidence. In contrast to anti-GM activists showing the bad sides, Monsanto was misinforming people by only showing the benefits of GM. They did not objectively take both sides into consideration while spreading information about the technology which could have led to bias in information. This is a potential source of false rumors and led to a lack of correct information to different stakeholders.

Another important point where interviewees experienced a lack of access to information was during the research phase of the process. Different interviewees mentioned that INERA was the research institute with monopoly on research regarding Bt. They were in charge and no other independent researcher was allowed to do research on the matter. Civil society and citizens did not have the tools to conduct independent research on Bt, even if they were allowed to. A member of an anti-GM organization felt like stakeholders had no access to research results because INERA was reluctant in sharing results. Looking further into this, other sources suggest INERA actually did share research results with Sofitex and ANB. A representative from the ANB added that the ANB verifies the research results and then further shares the information. He stated: "The scientific committee that supports the ANB analyzes the results. The ANB in turn sends the report to other socioeconomic researchers in the country". It is even said by a university researcher that INERA annually presented the research results regarding BT to different stakeholders.

It is not certain whether participants experienced a lack of time or a lack of access to transportation during participation events for the introduction of Bt cotton in Burkina Faso although it is likely that these factors did not play a major role. Stakeholders did have access to various kinds of expertise, both before the introduction of Bt cotton and once it was introduced. This mostly pertained to agronomic expertise provided by ANB scientists and INERA, which not all member of the public accepted as valid expertise. A possible explanation for this behavior is the fact that corruption is a well-known feature of authoritarian regimes as mentioned in the theoretical framework of this thesis. A corrupt scientist is not independent and might give biased advice to the stakeholders. The stakeholders might be skeptical about experts because they expect their opinion to be biased. Moreover, a lack of access to correct information might have hindered the effectiveness of the participation process. The information that farmers received was often limited and biased, and false rumors shaped their perception of the technology. The government, Sofitex, INERA, university researchers, the UNPCB, Monsanto, the ANB, and civil society groups were informed well at the first meeting in 2000 but after that, information from the government lacked. The stakeholders were sometimes informed by sources other than the government but this information was also sometimes biased. Moreover, stakeholders experienced a lack of access to the research results regarding Bt cotton. This however relies on

miscommunication, because the results were publicly available. The fact that scientists were not always accepted as expert, the lack of access to correct information, and the miscommunications regarding Bt cotton research hindered the effectiveness of the participation process.

5.4. Transparency and accountability

Transparency and accountability is the fourth criterion of the framework of Chilvers (2008). The participation process is more effective when it is more transparent. This means that the objectives of the process should be made clear to participants and also to the wider public, because the wider public should be able to see how decisions are made. For an effective participation process, accountability should also be taken into account and this means that there should be communication on how the participation process contributes to the actual decision making. Ideally, stakeholders should be informed before the participation process but also after the process, about how the input during the process influences decision-making.

Now decision-making regarding the research process of Bt cotton was not always transparent to the public. INERA and the government were responsible for the research process and a representative of an anti-GM organization stated: "And while they (INERA) were writing the legislation, they were also secretly doing experiments and trials with the BT cotton". This refers to the decision to start the field trials and illustrates that the government was not transparent about this decision. The stakeholders should have been informed about the decision to start with the field trials and the institutions not being transparent about this affects further decision-making and the effectiveness of the public participation process.

Later in the process when other stakeholders got to know about the field trials, the institutions selectively only shared positive research results, and were not transparent about the negative research results according to two representatives of different anti-GM organizations. One of the representatives even stated: "They (INERA) had already noticed the failure with Bt cotton quality, but they were forced to be silent". This refers to the disappointing Bt cotton quality from 2013 and onwards. The government knew about the quality issues before it became public and did not want INERA and anti-GM organizations to inform people about the negative side of Bt cotton. A researcher of a university in Burkina Faso adds to that by saying that the government only shared positive information on Bt cotton in media channels, which indicates a lack of transparency.

Accountability was also relatively low during the participation process. The government did not give any communication on how the process contributed to the actual decision-making. Because of this, multiple stakeholders felt like they had no influence on decision-making at all. A researcher of a university in Burkina Faso stated: "I've never seen a discussion or a meeting that changed the introduction of Bt cotton or even postponed it. That has never been done as the best time." which suggests that input and involvement in the meetings did not affect decision-making in any way. A representative of the ANB agrees and mentioned that events like the study tours to the field trials, where all stakeholders were included, was only to inform them

about the process and not to include them in decision-making. Moreover, a researcher of INERA thinks that the government does not take all perspectives into account in decision-making and a farmer stated the following: "If the government makes a decision, we (the farmers) have no choice other than follow".

Different key decisions that were made during the process of introducing Bt cotton were made only by a select group of politicians. The decision to start with the field trials was mode solely by the president, Blaise Compaoré, according to different interviewees including a representative of the ANB and members of anti-GM organizations. "The first cotton field trial was approved just by presidential decree." is what the employee of the ANB told the interviewer. As there is no record on how the participation process influenced the president on this decision, accountability here is considered low. Accountability on the final decision to adopt Bt cotton was also low. A Burkina Faso cotton-expert that was interviewed stated the following: "The final decision to introduce Bt was also only made by the minister of agriculture and some other people high up in the cotton sector" and this minister was a close ally to the president. A former member of the parliament mentioned in the interviews that the final decision to adopt Bt cotton was made because the government did not find many people against the technology and that the few demonstrations were not enough to stop the introduction. This suggests that the participation process did not really contribute to this decision to adopt Bt cotton and that the government did not pay much attention to the proponents of the new technology.

A part of the culture in Burkina Faso might explain the lack of accountability as it gives room for the government to make unaccountable decisions. Interviewed representatives of the ANB, INERA, and multiple farmers are convinced that citizens do not always know which decision benefits the country the most. They trust decision-makers to choose what is best for them and therefore think that a large part of the decision-making can be left to politicians and scientists. A farmer even stated: "The government always has the power to make the last decision, but they are more enlightened so they know what is best for the nation".

In short, transparency stimulates an effective participation process and transparency was limited during the introduction of Bt cotton in Burkina Faso. The government was not transparent about the early stage of the research process and about the decision to start with the field trials. Accountability during the participation process also lacked. It is unclear how and if the participation process influenced decision-making and stakeholders felt like they were not contributing to decision-making. Different key decisions were made by the government only with no links to the participation process. The culture in Burkina Faso might explain why the government was able to make unaccountable decisions as citizens trust decision-makers to choose best. Nevertheless, the lack of transparency and accountability hindered the effectiveness of the participation process.

5.5. Learning

The fifth criterion of the framework of Chilvers (2008) relates to social learning. To fulfill the dimension of learning, social learning of all stakeholders should be stimulated during the

participation process. This can be done by organizing events that allow social learning, for instance through small group sessions with face-to-face contact or through repeated meetings over a period of time. Such events give participants the chance to learn from the values and beliefs of other participants, which can help them in shaping their opinion about the technology.

Now during the participation process for the introduction of Bt cotton, quite a few different events were organized which allowed social learning between stakeholders. Representatives of Sofitex, Monsanto and the UNPCB attended a study trip together in the early stage of the participation process according to a member of the UNPCB. They went to countries where Bt cotton was grown to see how the technology works. The study trip allowed the stakeholders to directly discuss the technology with each other. As mentioned earlier, the AICB was created to lay direct contact between cotton companies and the UNPCB. This promoted social learning between these two stakeholders. Moreover, the AICB organized different meetings to discuss the technical aspects of cotton which resulted in face-to-face meetings with Monsanto, research institutes, UNPCB and the cotton companies.

Direct contact between stakeholders was also high during the study tours at the trial locations in 2007. These tours were organized by the government and INERA and all stakeholders were included in this event to evaluate the field trials and to discuss the technology with each other. A representative of the ANB stated about these meetings the following: "So I realized they were learning from each other. The farmers were trying to understand how scientists were making efforts to solve their problems. The scientists were trying to understand the issues that the farmers were having. When they (INERA) were doing the trials with the farmers, they had regular interaction with stakeholders, so nothing was a surprise. Farmers visited test sites to ask questions and to understand what to expect and when to expect. They did a good job in that, the dialoguing with all the key stakeholders". This quote illustrates that the level of social interaction and the social learning that comes with it was high at the time of these field trials, especially between the invited farmers and scientists. The downside is that not all farmers had the chance to attend the study tours at the trial locations.

A variety of repeated meetings took place during the participation process which promoted social learning. The Cotton Technical Agents (ATC) that were mentioned earlier regularly visited local farmers and discussed with them the issues and concerns they were experiencing. They functioned as a sort of middleman, as they also visited other stakeholders to express the opinion of farmers to them. Although it did not provide direct contact between farmers and stakeholders, the repeated meetings with the ATC's allowed the stakeholders to learn from each other's perspectives. In addition, INERA and Monsanto meet annually to discuss their view on the Bt cotton research. They collectively come to a vision on what technologies and aspects have to be tested in the future. Another annual event that brings stakeholders together is the week of the farmer. During this event, farmers from all over the country gather and share the issues they are experiencing with each other which includes issues with Bt cotton. This event functions as an exhibition and is open to the public and thus all stakeholders can join. The government and even the president himself is present to start discussions with farmers, so that the points of view and beliefs of the farmers can be understood. An employee of the ANB stated

about this event: "They (the farmers and other stakeholders) have a whole day of discussing with the president and with the government, a whole day". Annual meetings were even hosted after the introduction of Bt cotton. Different stakeholders and a technical group participated in these meetings to discuss the progress and concerns of Bt cotton, which included the issues with the fiber length after 2013.

So to conclude, the learning aspects of the participation process was well fulfilled. Monsanto, Sofitex and the UNPCB learned from each other through an international study tour and through the AICB. Study tours at the field trials also allowed social learning, and all relevant stakeholders were invited to these tours. Although, not all farmers had the chance to attend the study tours, stakeholders learned about the perspectives of farmers through ATC's, and through the week of the farmer. Altogether, social learning increased the effectiveness of the participation process.

5.6. Independence

Chilvers (2008) identifies independence as the sixth criterion of his framework. Effective participation processes should be managed independently and neutral. Institutions that lack independence might steer the process in certain directions that fits their preference. The opinion of the stakeholders that contradict institutions might be left out of the decision-making process which causes bias. This bias does not occur when neutral and independent organizations are responsible for the participation process. Bias can also occur when participating representatives of stakeholders are not independent and connected to institutions. For example, when representatives of stakeholders are financially dependent on institutions, they might rather defend the interests of the institutions than the stakeholders they are supposed to represent. Any stakeholder with relationships to institutions should be left out of the participation process.

Interview results suggest that the government was not neutral and steered the participation process through different methods. First, they made sure to convince every stakeholder that Bt cotton is in every situation the best solution to the initial cotton problems, so that it was more likely that the participants were pro Bt cotton. The government was always defending Bt cotton and according to a member of an anti-GM organization, researchers working for the government defended Bt cotton even before the new technology was tested, so without solid evidence. They were pleading for it in the media, as a researcher from a university in Burkina Faso stated: "All those discussions on TV took place where they (the government) were advocating this GM crop. They were saying that it will reduce pesticide use and that it will have a good impact on the environment and so on". Moreover, a scientist from the ANB mentioned in an interview that the sole purpose of the study tours at the trial locations in 2007 with all stakeholders was to promote Bt cotton and to show all participants how well the new seed worked. In reality, the Bt cotton seeds were not as good as the government promised. Farmers that adopted Bt cotton noticed that the new seed disappointed them and a farmer stated in an interview: "What I know now after adopting BT cotton is that the Bt crop weighs less and performance is not as good as they (the government) say". This raises concerns about the independence of the attitude of the government.

Another method that the government used to steer the participation process towards the introduction of Bt cotton was by concealing the negative effects of Bt cotton. The government did not always allow freedom of speech, which is typical for authoritarian regimes. An employee of Monsanto illustrates that with the following quote: "Because you have to understand that it is all strategy, that the government is not going to let you do anything and let you say anything you want, yes that's true". With this attitude of the government towards Bt cotton in mind, this suggests that the stakeholders were not always allowed to vouch for the negative effects of the new technology. This interpretation is backed up by two different interviewed members of anti-GM organizations. One interviewee told the interviewer that some people that were against GM were afraid to be put into prison if they were going to join demonstrations against Bt cotton. This resulted in demonstrations on a smaller scale as some people were discouraged to join the demonstrations. The other interviewee from an anti-GM organization mentioned that the government did not want anti-GM organizations to tell the public about the harms of Bt cotton. The lack of independent information about the negative effects of Bt cotton might have resulted in less resistance to the introduction of Bt cotton by the stakeholders, which is exactly what the government wanted.

The research process and the results regarding Bt cotton were also manipulated to fit the preferences of institutions. A researcher from a university in Burkina Faso believes that there were no independent reports on the positive or the negative impacts of Bt cotton during the participation process. This too might have to do with the fact that the government did not allow freedom of expression, but according to a representative of an anti-GM organization it has also to do with the fact that the government assigned the scientists that were going to do research on Bt cotton. This interviewee believes that the government told these scientists to do research in the way the government wanted them to do research, which resulted in a lack of independence in this research. Another interviewee, who is also a member of an anti-GM organization, conducted interviews at field trial locations and the results were completely the opposite of what the government told the public and what they made the public read. Either way, there are hence clear indications that the research was not completely independent. A former employee of INERA and an employee of ANB agree because they are convinced that it was well known by the government and INERA that Bt cotton had quality problems during the field trials, yet they remained silent about these issues and aimed for the introduction of the new technology. A member of an anti-GM organization stated the following in the interviews: "They (INERA) did already notice the failure, but they were forced to remain silent". This indicates that the government even forced INERA to be silent, which clearly indicates that the government steered the participation process in a certain direction.

Last, several interviewees questioned the independence of the government by arguing that the government had political reasons to favor the Bt cotton version of the American company Monsanto, which suggests the government steered the participation process in a certain direction. Before the introduction of Bt cotton, the relation between Burkina Faso and the United States was strained for various reasons. The United Nations (UN) submitted a report in 2000 revealing Burkina Faso's involvement in illegal traffic arms trade and diamond smuggling, which

breaches UN sanctions (Santiso & Loada, 2003). It is believed by a university researcher and an anti-GM organization member that Burkina Faso wanted to restore the relationship with the UN and the US by introducing Bt cotton from Monsanto, because it is an American company, and not with other seed companies such as Syngenta. This might explain why the government aimed to introduce Bt cotton. However, other interviewees are convinced that there were other reasons that Monsanto was chosen as the company to collaborate with. An employee at the AICB noticed that Monsanto was responding to the cotton issues in Burkina Faso in the best possible way. He stated about this matter: "The new partner that the AICB had was Monsanto. They were chosen because they charmed everyone more than the other firms. Monsanto was responding to our pest problem". Moreover, according to INERA, Monsanto was the first to finish the Bt tests and trials. Another reason that the government chose Monsanto was because Monsanto bought the Bt cotton project that Syngenta was working on, which means that they bought out their most threatening competitor. Both representatives from Monsanto and from INERA confirm this story. The independence of the choice to collaborate with Monsanto and introduce Bt cotton in Burkina Faso is questionable and the opinions of interviewees are divided. It is unclear what the decisive reasons were to make these decisions.

Beside the fact that the government steered the participation process in the direction of their wishes which resulted in a lack of independence, there were also different participating representatives of stakeholders that were not independent and connected to institutions which can also hamper the effectiveness of the participation process. In an effective participation process stakeholder with relationships to institutions should be left out of the participation process, as Chilvers (2008) mentions. There is INERA, which is highly dependent on the government and influenced by the government, as a member of an anti-GM organization said: "INERA defends Bt cotton. It is the state that instructed them in this direction". A researcher at a university in Burkina Faso and a former member of the parliament confirm the relation between the government and INERA. To put it even worse, all researchers are "state-owned" according to a representative of the UNPCB. Still it is believed that university researchers are able to speak more freely than INERA researchers. An interviewed researcher at a university says the following about this: "So luckily, what they (university researchers) are saying is they are what they are thinking really". But INERA is the research institute with the monopoly on research regarding Bt cotton. Monsanto has copyrights on the Bt seeds and outsourced the research to INERA only. Therefore, it is not allowed for anyone besides INERA to do research on the matter, making it impossible to conduct independent research on Bt cotton.

The independence of Sofitex is also questionable. Different interviewees including a former parliament member, a scientist, an employee at Monsanto and a member of an anti-GM organization mentioned in the interviews the dependence of Sofitex on the government. Some argued that Sofitex is owned by the government. A member of the UNPCB adds that the employees of Sofitex are basically government employees. Sofitex receives subsidies from the state and is dependent on loans that are used for projects and granted by banks owned by the state. This quote made by a scientist illustrates the dependence on the state: "If there are problems with Sofitex, it is to be feared that certain banking groups will withdraw from the project". Sofitex is afraid to lose their capital and will therefore not contradict the government.

According to a farmer, "Sofitex' leaders are political.", which can be a source of bias in the participation process. The fact that Sofitex has a relationship to institutions hindered the effectiveness of the participation process.

The former UNPCB chef that was leading the UNPCB during the participation process also had relationships with the government. The government is not directly present in the UNPCB, but the organization is highly dependent on subsidies from the government, according to a former member of the parliament. He illustrates this with the following quote: "The UNPCB is like the FIFA. Yeah, they say they are free but they are dependent on a lot of super subsidies from the government. But officially speaking, they are free". The former UNPCB chef defended the interests of the government rather than those of the farmers because of this dependence. A member of an anti-GM organization said that the former UNPCB chef was in favor of Bt cotton before the technology was even researched, indicating his non-neutral attitude and his support for the government. Vice versa, a Monsanto representative believes that the government protected the former UNPCB chef during the process of the Bt cotton introduction when the UNPCB was malfunctioning. A representative of Sofitex adds that the state used the former UNPCB chef to promote Bt cotton to farmers and said: "He (former UNPCB chef) was part of the team of the government". According to a farmer, members of the UNPCB are in turn manipulated by managers higher in the hierarchy. UNPCB members will follow the position of the chef because he has political power over them. A former member of the UNPCB experienced this dependence himself. He mentioned that the UNPCB chef can demote anyone within the UNPCB if he is unhappy with this person. This is the reason that members choose to defend the position of the chef during votes, which can cause more bias within the UNPCB and eventually in the participation process.

Altogether, it is safe to assume that the effectiveness of the participation process was hindered by a lack of independence and neutrality. The government steered the participation process so that their needs were to be fulfilled. They did this by only showing the benefits of Bt cotton so that introducing the technology was more convincing. They also prevented stakeholders from receiving information on the negative effects of Bt cotton. This might have caused bias in the way stakeholders perceived the new technology. Moreover, the choice to collaborate with Monsanto is questionable and is possibly related to international politics rather than rational decision-making. Another potential source of bias in the participation process are relations between representatives of stakeholders and the government. According to Chilvers (2008), the representatives that are not independent should be left out of the participation process. In the case of the introduction of Bt cotton in Burkina Faso, multiple key stakeholders such as INERA, Sofitex, and the UNPCB had relationships with the government. This form of corruption comes as no surprise as corruption is typical in authoritarian regimes. It made the participation process become less effective.

5.7. Efficiency

The seventh and last criterion of the framework of Chilvers (2008) is the criterion of efficiency. The participation process should be timely-efficient to be fully effective meaning that all relevant

stakeholders should be involved in the process as soon as is reasonably possible. When certain stakeholders are involved too late in the process, they might miss out on information and aspects that influence their opinion regarding the technology and it might have a negative impact on the trust that the stakeholders have in each other. Moreover, the opinion of stakeholders must be taken into account in all decisions including early decisions. This relates to the dimension of efficiency and a more timely efficient participation process means that the process is more effective.

Interviewees across the board agreed that genuine involvement in decision-making came too late and only after the first decisions on Bt cotton were made. Participants felt no involvement in the decision whether to start with the field trials. A representative of the ANB for example stated: "So I would say in a nutshell that at the beginning I do not think all of the stakeholders that the Cartagena protocol mentions were involved in making a decision for the confined field trials". As mentioned before, this decision was made with presidential decree. Farmers also experienced the lack of involvement in decisions regarding Bt cotton research. One interviewed farmer mentioned that neither the individual farmers or the UNPCB were involved in those decisions. It was only after the numerous larger trials had started in 2007 that farmers were feeling real involvement, as another farmer said: "No, we were never involved in research in the province of Comoé from the start. It was at the time of popularization that we were involved". Involvement only after popularization clearly indicated that this involvement was too late to be fully efficient.

Some interviewees even argue that involvement of stakeholders came only after the final decision to adopt Bt cotton. A researcher of a university stated: "It would have been better to involve all the stakeholders before the decision to introduce Bt". He thinks that the government introduced Bt cotton before having a good public debate on it. A member of an anti-GM organization backs this up by saying the following: "Normally, you would first discuss in a conference whether to introduce BT at all, and after that you make legislation. Here, the process was reversed and legislation was made before the discussion". Decisions about the introduction and legislation were already made before discussions about these decisions.

There are also indications that the introduction of Bt cotton was rushed and without careful consideration. According to a researcher of INERA the reason for the rush was because the political will to introduce Bt cotton was high. A former member of the parliament confirms this statement and also mentions the high political will. An interviewed researcher of the ANB and a member of an anti-GM organization think that the rush led to the fact that not all negative side effects of Bt cotton were checked thoroughly. INERA admits that they did not do enough backcrossing with Bt cotton because of the rush, which led to the problem with Bt cotton fiber length. The rush could have contributed to the fact that early decisions were made before taking time to involve all stakeholders in these decisions.

The participation process for the introduction of Bt cotton in Burkina Faso was not as efficient as possible, which might have hampered effectiveness. Multiple sources are convinced that involvement in decision-making came too late and only after decisions were already made. Participants felt involvement after popularization of the field trials. However, they should have

been involved in the decision whether to start the field trials in the first place. Moreover, the introduction of Bt cotton in general was rushed. This could also have negative implications for the effectiveness of the participation process.

5.8. Authoritarian regimes

Within the participation process for the introduction of Bt cotton in Burkina Faso there were multiple aspects of the framework of Chilvers (2008) that stimulated effective public participation (see table 2). We have identified the government, cotton farmers, cotton companies, research institutes, universities, cotton seed companies, the ANB, and civil society as relevant stakeholders. Out of these stakeholders all but the cotton farmers were included in a variety of participation events. Different discussion sessions during events allowed direct contact between these included stakeholders. There was room for social learning during the participation process. Moreover, all relevant stakeholders were invited to study tours at trial locations and annual events brought stakeholders together. During these events the stakeholders learned about the values and beliefs of each other. There is no evidence the participation process was hindered by a lack of time or a lack of access to transportation. The participants also had access to the support of experts during the participation process, mostly pertained to agronomic expertise provided by ANB scientists and INERA, which could have increased the effectiveness of the participation process.

However, looking at the criteria identified by Chilvers (2008) there were even more aspects that hindered effective public participation for our case study (see table 2). Although most stakeholders were included in different participation events, the inclusion of cotton farmers was limited and they were underrepresented. The UNPCB is supposed to defend their interests but failed in doing so. Universities and the ANB were also to a lesser extent included as they were not involved in meetings regarding essential research. Because the inclusion of farmers was limited, the farmers did not have much direct contact with other stakeholders and they were not always able to discuss the new technology with other stakeholders. Other stakeholders had direct contact with each other during different participation events and these moments of direct contact stimulated effective public participation but did not directly lead to collective decision-making. Therefore, the direct contact between the stakeholders mentioned above only improved the effectiveness of the public participation process to a limited extent.

A lack of access to correct information also hindered the effectiveness. Moreover, stakeholders had access to the support of experts during the participation process but not all member of the public accepted scientists as valid experts making the support of these scientists less valuable. Another barrier for the effectiveness of the participation process was the lack of transparency, accountability, and independence. The government was not always transparent about the research process and the government made unaccountable decisions. It was unclear how the participation process influenced decision-making and stakeholders felt like they could not contribute to decision-making. The government was not independent and steered the participation process in certain directions by only showing Bt cotton's benefits and shutting down criticisms. This affected the perception of stakeholders. Chilvers (2008) mentions that

representatives of stakeholders with relations to institutions should be left out of the participation process and this was certainly not the case in the participation process for Bt cotton in Burkina Faso. INERA, Sofitex, and the UNPCB were key stakeholders and representatives were dependent on the government. Finally, a lack of efficiency hindered the effectiveness of the participation process as the involvement of stakeholders in decision-making came only after decisions were already made, and the participation process was rushed.

Table 2: Aspects of the criteria of the framework of Chilvers (2008) that either promoted or hindered the effectiveness of the public participation process.

Criteria	How it stimulated effectiveness	How it hindered effectiveness
Representativeness and inclusivity	- All relevant stakeholders except the cotton farmers were included in a variety of participation events.	- The inclusion of farmers in participation events was limited and the farmers were not represented well. - Universities and the ANB were not included in all relevant events regarding research.
Fair deliberation	- Different participation events allowed direct contact and discussions.	- The direct contact farmers had with other stakeholders was limited. - The direct contact other stakeholders had, did not directly lead to collective decision-making.
Access to resources	- It is likely that transportation and time did not hinder the effectiveness of the process. - Stakeholders had access to the support of experts during the participation process.	- Stakeholders experienced a lack of (correct) information. - Scientists were not always accepted as experts by the stakeholders.
Transparency and accountability		- There was a lack of transparency regarding research. - It is unclear how and if the process affected decision-making.
Learning	- Direct contact and repeated meetings over periods of time allowed stakeholders to learn from values and beliefs of others.	
Independence		- The government was not independent and steered the participation process. - Key stakeholders had relations with the government.
Efficiency		- Real involvement in decision-making came too late. - The introduction of Bt cotton was rushed.

It is safe to say that due to the different identified aspects that hindered the effectiveness of the public participation process, public deliberation was low, which indicates that the decision-making process for the technology of Bt cotton was to a lesser extent democratized. All criteria that measure the effectiveness of public participation are interrelated and the lack of independence and neutrality influenced the other criteria. The government, INERA, Sofitex, and the UNPCB were not neutral and it is likely that they did not speak freely during events. Social learning and discussions that are supposed to promote fair deliberation could have been biased because of this, as the lack of independence forms a barrier for other participants to learn of the true values and beliefs of other stakeholders. The lack of independence of the government led to a lack of access to neutral information for stakeholders because the government controlled information flows. Moreover, it affected accountability as the government wanted to steer the participation process in certain directions and therefore took decisions without taking the participation process into consideration. Looking at the criterion of representativeness and inclusivity, the fact that farmers were not represented well negatively influenced their access to fair deliberation and to resources. It also influenced efficiency as farmers were left out of the early decision-making process because it was assumed that they were represented by the UNPCB. The lack of independence and the lack of inclusivity and representativeness are in this case the grounding of the ineffective participation process.

The limitations to democratic governance of the technology were related to the authoritarian nature of the Burkinabe regime in several ways. First, a common characteristic of authoritarian regimes is that the government tries to control the media and information flows to the public (Geddes & Zaller, 1989). They do this so that the (political) attitudes of their citizens can be shaped in the way the government prefers. We have seen in the case study that the government steered the process in a certain direction by only sharing information about the positive side of Bt cotton, which relates to the criterion of independence and also explains the lack of transparency. Moreover, the government made sure that other providers of information such as scientists or civil society did not spread information about the negative sides of Bt cotton as there was not always freedom of expression. They did this so that the attitude of stakeholders towards the new technology would be positive which is in line with the way the government preferred it to be and it led to a lack of information for the stakeholders. The fact that governments in authoritarian regimes try to control the information flows to the public to shape the attitudes of the citizens restricted the criteria of access to resources, independence, and transparency identified by Chilvers (2008), while these criteria are key for the effectiveness of the public participation process and therefore for democratic decision-making.

Second, authoritarian regimes are characterized by the fact that corruption can thrive well in their regimes and this can negatively influence independence and inclusivity in a participation process (Fjelde & Hegre, 2014). Through corruption, stakeholders can manipulate public institutions and public institutions can manipulate stakeholders. We have seen instances of corruption in the case study of Bt cotton in Burkina Faso. INERA, Sofitex, and the UNPCB were (financially) dependent on the government and this made it possible for the government to manipulate the stakeholders and shape them to their preference. Moreover, the UNPCB chef

defended the point of view of the government instead of defending the points of view from the farmers, so that the government in turn protected him when he was using part of the subsidies for the UNPCB for his own illegitimate private gain. This form of corruption contributed to a lack of inclusivity and representativeness of the farmers in the participation process. Corruption could also have been the reason why scientists were not always accepted as experts by the stakeholders, because the public assumes the scientists to be corrupt which means they do not trust these experts, which negatively affected the access to experts. Corruption restricted the criteria of independence, representativeness and inclusivity, and access to resources and thus hinders democratic decision-making.

Third, another characteristic of authoritarian regimes is that political diversity is often unacceptable and political mobilization is limited in authoritarian regimes (Linz, 1975). This means that the rulers in authoritarian regimes will not accept citizens to politically oppose the rulers. This relates to the criterion of independence in our case study as the government was pro the introduction of Bt cotton and we have seen that the government tried to shut down criticisms. An employee of Monsanto stated about this issue the following: "Because you have to understand that it is all strategy, that the government is not going to let you do anything and let you say anything you want, yes that's true". This illustrates how unaccepting the government was towards citizens that with another point of view than that of the government. Moreover, citizens that are against GM were afraid to demonstrate against Bt cotton as they knew how unaccepting the government was towards political diversity. The fact that the government did not accept political diversity also explains the lack of accountability. The government made key decisions without any relations to the participation process as the government was pro Bt and the opinion of the opponents was not accepted. Concluding, democratic decision-making for Bt cotton was hindered by the unacceptance of political diversity and the lack of political mobilization because it restricted the criteria independence and accountability of the framework of Chilvers (2008).

The government controlling the media and information flows, the corruption, and the unacceptance of political diversity formed a barrier for the participation process in this case study to be democratic and this can also be a barrier for participation processes for technology decision-making in other authoritarian regimes. In most authoritarian regimes corruption is an issue, the government plays a controlling role, and political diversity is not accepted. This means that participation processes in these regimes can only to a certain extent be effective and a less effective participation process means a less democratized process. This suggests that technology decision-making in authoritarian regimes can only be limited democratized.

It is arguable that the governance of technology can be more democratic in strong authoritarian regimes compared to weaker authoritarian regimes. Corruption is one of the barriers that hinders the democratic governance of technology in authoritarian regimes and I mentioned in the theoretical framework of this thesis that rulers in authoritarian regimes are better in protecting the state from corruption when they have more political power (Amundsen, 1999). Therefore, strong authoritarian regimes are less corrupt and participation processes regarding technology are less hindered by corruption in these regimes.

6. Discussion

The lack of representativeness and inclusivity, access to resources, transparency and accountability, independence, and efficiency formed barriers for a democratic governance of technology. The characteristics of authoritarian regimes that explain the lack of democratic governance for technology are corruption, the lack of acceptance of political diversity, and the fact that the government tries to control the media and information flows. These are characteristics that most authoritarian regimes possess and therefore the results indicate that technology can currently only be governed democratically to a certain extent in authoritarian regimes.

These findings add to the body of literature of the democratic governance of technology as previous research on this topic is based on countries where the overall governance is democratic (e.g. Chopyak & Levesque, 2002; Einsiedel, Jelsøe & Breck, 2001; Joss, 1999). Little is known about how democratic governance of technology works in countries where the overall governance system is authoritarian. The results of this thesis give useful theoretical insights about the conditions under which technology can be governed democratically in authoritarian regimes. This thesis also gives insights about the conditions under which technology can be governed democratically in any governance system, besides democratic and authoritarian governance systems. In any regime with issues such as corruption, unacceptance towards political diversity, and a government that controls the media, the governance of technology can only to a certain extent by democratized. Therefore, this research gives a different perspective on democratic processes for any governance system.

The results showing that the governance of technology in authoritarian can only to a certain extent be democratized are in line with what was expected. I expected that participation processes in authoritarian regimes allowed at least some form of democratic governance as studies show that certain public participation methods for technology decisions can be adapted in different countries in the world with different governance systems and cultural foundations (e.g. Einsiedel, Jelsøe & Breck, 2001; Stagl, 2006). In contrast, I also expected that the governance of technology in authoritarian regimes could not be highly democratized. Countries with an overall democratic governance system are designed to allow public involvement in decision-making (Held, 2006) while authoritarian regimes are not. By definition, authoritarian regimes cannot tolerate contending centers of power (Huntington & Moore, 1970) and therefore I expected that the governance of technology could not have been highly democratic in authoritarian regimes.

The fact that corruption can hinder the democratic governance of technology is also in line with what was expected from results of previous research. Studies exists that show examples of democratic countries in Africa where corruption led to a less democratic overall governance, for instance in Ethiopia (Aliye, 2020). As corruption can hinder democracy in the overall governance of countries, it comes as no surprise that corruption can also hinder the democratic governance of technology.

I also expected that a lack of acceptance of political diversity can form a barrier for the democratic decision-making of technology in authoritarian regimes. Almond and Powell (1966), and Huntington and Moore (1970) state that politics in authoritarian regimes are a matter of anti-regime violence rather than political participation of the public. This suggests that effective public participation, and thus democratic decision-making, can be hindered by anti-regime violence which originates from the unacceptance of political diversity.

Previous research also demonstrates that the government controlling media and information flows can hinder democratic decision-making for technology. Different studies show that information is an important input to the deliberation of citizens (e.g. Cheyne & Comrie, 2002; Johnson, Black & Knobloch, 2016; Smith & Wales, 1999; Thompson & Hoggett, 2001). From a deliberative democratic perspective, this suggests that information to citizens is important for democratization. Therefore, it is only logical that democratic decision-making processes for technology can be hindered when the information that citizens receive is incorrect or biased, in the case of authoritarian regimes because the government tries to manipulate and control the information.

There are certain limitations of this study that should be acknowledged. First, this research did not take the sudden reversal of Bt cotton into account in the analysis. This thesis was limited to the introduction of Bt cotton as the interviews were conducted in the first months of 2016. At this time, Bt cotton was still produced and the decision to stop with the technology was not taken yet, and therefore interviewees did not give information on the participation process for that specific decision. The public participation process for the decision to reverse the introduction of Bt cotton could have given interesting insights as this participation process took place under different political circumstances.

Second, the interviews used for the analysis were not conducted by myself but by a researcher from the University of Groningen. For our case study it was important to get to know what the attitude of participants towards the participation process of the introduction of Bt cotton was. For example, it was important to know whether participants were angry because they felt like they were left out of the participation process. Non-verbal signals could have been important during interviews because such signals can give insight in the attitude and the emotions or feelings of the interviewed person (Wharton, 2009). I did not have access to these non-verbal signals as I received the interview data as audio files which could have led to different interpretations.

Third, the researcher that conducted the interviews did this for the good of his own research and without taking into account the aim of this thesis. Because of that, the questions that were asked during the interviews were not specified to this thesis and to the framework of Chilvers (2008). It limited the information in the data about the access to time and access to transportation that participants had as this was less relevant for the research of the interviewer. If I conducted the interviews myself, I would have asked the interviewees about these aspects of the criterion of access to resources. However, it is unlikely that access to time and access to transportation played a major role in the participation process. If these factors influenced the participation process, the interviewees would have mentioned these factors as the semi-structured format of

the interviews gave participants the freedom to come up with information that is important (Drever, 1995; Gill et al., 2008).

The interviews that were conducted are a reliable source of information. We know that governments in authoritarian regimes try to control flows of information (Geddes & Zaller, 1989) and it is possible that interviewees feared the consequences of spreading information that the government does not want everyone to know. However, the interviews were conducted in early 2016. Before the interviews were conducted, the government of Blaise Compaoré, that was in charge during the introduction of Bt cotton, had resigned. The government that wanted to prevent citizens to spread information about the introduction of Bt cotton was no longer ruling Burkina Faso and the interviewees must have been very much aware of this. Providing the interviewer with information no longer had consequences for the interviewees which made them speak freely. Moreover, the interviewer explicitly mentioned that anonymity of the interviews was guaranteed, which made the interviewees even more aware that they were able to speak freely.

To make the governance of technology in authoritarian regimes more democratic, the following barriers should be overcome: the government controlling the media and information flows; the corruption; and the unacceptance of political diversity. I suggest to target further research on two different aspects to accomplish this. First, research should be targeted on how to change the political structure of authoritarian regimes as this might be the cause of the barriers. The values and norms of politicians, and the relationship between state and the business sector can for example be political causes of corruption and this origins from the political structure of the authoritarian regime (Fijnaut & Huberts, 2002). Research should be conducted on how the political structure in authoritarian can be shaped to allow democratic decision-making for technology. Perhaps, researchers should look further into the Chinese anti-corruption campaign in 2013 as studies show that this campaign was effective in reducing corruption between companies and government officials (Hao et al., 2020).

Second, alternative ways to overcome the barriers within the participation process should be investigated. For example, experiments should be done in which independent organizations manage the participation process for decision-making for certain technologies in authoritarian regimes. Results of these experiments will show whether this can help tackling the barriers for democratic governance of technology. The research might show that corruption within the participation process can possibly be overcome when the process is managed by an independent organization. An independent organization might also stop the government from controlling information flows. Moreover, there might be more acceptance of political diversity within the participation process as the independent organization can allow diversity. This suggests that introducing independent organizations to manage participation processes might allow the democratic governance of technology, which is definitely worth doing further research on.

7. Conclusion

The aim of this research was to explore whether and to which extent technologies can be governed democratically in authoritarian regimes. Currently, a research gap exists. Previous literature about the democratization of technology is based on countries where the overall governance system is democratic (e.g. Chopyak & Levesque, 2002; Einsiedel, Jelsøe & Breck, 2001; Joss, 1999) and little is known about the democratization of technology in authoritarian regimes.

The case study of the participation process for the decision-making whether to adopt GM in Burkina Faso was used to answer this research question. Interviews with different stakeholders in the country were analyzed using the framework of Chilvers (2008) to explore how effective the participation process was. The results show that certain aspects of the participation process allowed a democratic governance of technology. Most relevant stakeholders were included in the participation process and different participation events allowed fair deliberation between stakeholders. Stakeholders were also able to learn from the values and beliefs of each other through these events. Moreover, the participation process was most likely not hindered by a lack of time and participants had access to the support of experts.

However, the results also pointed out that the democratization of technology in Burkina Faso was hindered by a lack of representativeness and inclusivity, access to resources, transparency and accountability, independence, and efficiency. The inclusion of farmers in the participation process was limited and they were underrepresented as the UNCPB did not defend their interests. The cotton farmers experienced almost no fair deliberation for this reason. In addition, the fair deliberation that all other stakeholders experienced did not lead to collective decision-making which further questions the effectiveness of the participation process. The stakeholders did not receive correct information on Bt cotton and this formed another barrier for the effectiveness of the participation process. Moreover, the government was not transparent regarding the research process for Bt cotton and made unaccountable decisions. The lack of independence is another issue that did not stimulate the effectiveness of participation process. The government steered the process by selectively sharing information about the positive effects of Bt cotton and concealing the negative effects. Representatives of stakeholders were not independent and had relations with the government. Last, the effectiveness of the participation process was hindered because stakeholders felt that involvement in the decision-making process came too late and only after key decisions were already made.

Authoritarian regimes are often characterized by corruption, the fact that the government tries to control the flow of media and information in the country, and by their unacceptance towards political diversity (Fjelde & Hegre, 2014; Geddes & Zaller, 1989; Linz, 1975). These characteristics explain why there were multiple factors that hindered the effectiveness of the participation process in the case study. The government controlling information flows resulted in a decrease in independence and transparency, while corruption led to less independence and inclusivity, and caused participants to have less trust in information and experts. Moreover, the lack of acceptance of political diversity restricted the criteria of independence and accountability.

Corruption, a controlling government, and limited acceptance of diversity are issues in most authoritarian regimes. Therefore, it can be concluded from the qualitative analysis that the governance of technology can only to a certain extent be democratized in authoritarian regimes.

We now know under which conditions technology can be governed democratically in authoritarian regimes. Corruption, the government trying to control information flows, and the unacceptance of political diversity forms a barrier for democratic governance of technology in authoritarian regimes. To further democratize decision-making for technology in these regimes, research should be conducted on how to overcome these barriers. Overcoming the barriers and further democratizing decision-making for technology in authoritarian regimes will cause the public interests to be better reflected in decision-making (Sismondo, 2010). Moreover, democratic governance of technology decisions can prove to be valuable for decision-making as it gives politicians and participants new knowledge about the threats and opportunities of the technology (Andersen & Jæger, 1999).

I suggest to target future research on how to improve the structure of authoritarian regimes as the political structure is the cause of the barriers mentioned above. Ways to change the values and norms of politicians, and to change the relationship between the government and the business sector should be explored for example. Researchers should also learn from previous work on how to overcome the identified barriers. For instance, China reduced corruption with an effective anti-corruption campaign in 2013 (Hao et al., 2020). Moreover, alternative methods to overcome corruption, the controlling government, and the lack of acceptance of political diversity should be investigated.

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Acknowledgements

Before and during the writing of my master's thesis I received a great deal of assistance. I am particularly grateful for the support given by Dr. Koen Beumer, my research supervisor. Your patience and feedback contributed to a better thesis. You were always open for questions and encouraged me to work hard. Thank you for that. I would also like to thank the second reader, Dr. Susan van Hees, for taking the time to assess my thesis. Finally, I wish to show my gratitude to Caspar Roelofs for gladly sharing his interview data.