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RESEARCH

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Building trust in biotechnology crops in light of the Arab Spring: a case study of Bt maize in Egypt

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Abstract

Background: The case of *Bacillus thuringiensis* (Bt) maize in Egypt presents a unique perspective on the role of trust in agricultural biotechnology (agbiotech) public-private partnerships (PPPs). This is especially relevant given the recent pro-democracy uprisings that spread throughout the Arab world that have significantly impacted the current political climate and status of both the public and private sector, and especially public-private collaborative initiatives. This case study aims to shed light on various trust-building practices adopted, and trust-related challenges faced, in the Bt maize project in Egypt.

Methods: We reviewed published materials on Bt maize in Egypt and collected data through direct observations and semi-structured, face-to-face interviews with stakeholders of the Bt maize project in Egypt. Data from the interviews were analyzed based on emergent themes to create a comprehensive narrative on how trust is understood and built among the partners and with the community.

Results: We have distilled five key lessons from this case study. First, it is important to have transparent interactions and clearly defined project priorities, roles and responsibilities among core partners. Second, partners need to engage farmers by using proven-effective, hands-on approaches as a means for farmers to build trust in the technology. Third, positive interactions with the technology are important; increased yields and secure income attributable to the seed will facilitate trust. Fourth, there is a need for improved communication strategies and appropriate media response to obviate unwarranted public perceptions of the project. Finally, the political context cannot be ignored; there is a need to establish trust in both the public and private sector as a means to secure the future of agbiotech PPPs in Egypt.

Conclusions: Most important to the case of Egypt is the effect of the current political climate on project success. There is reason to believe that the current political situation will dictate the ability of public institutions and private corporations to engage in trusting partnerships.

Background Maize in Egypt

Considered as one of the principal crops in Egypt, maize is planted on approximately 728, 000 hectares of land, 75, 000 hectares of which is devoted to yellow maize while the remainder is designated to white maize [1]. Each year, 6.1 million tonnes of maize is produced domestically in Egypt. Moreover, 4.1 million tonnes of yellow maize is imported annually, valued at \$US 1.3 billion [1].

Ajeeb-YG, the *Bacillus thuringiensis* (Bt) maize variety currently found in Egypt, was developed as a cross between MON810, a variety of genetically modified (GM) maize developed by Monsanto Company, and Ajeeb, a local Egyptian maize variety, by scientists working for the multinational agricultural biotechnology company Monsanto in South Africa [2,3]. Ajeeb-YG has been tested in Egypt since 2002 [4]. It is resistant to the three maize borers that pose a significant threat to conventional Egyptian maize seed varieties and has been shown to increase yield by up to 30% over conventional varieties when tested in field trials [5,6]. Ajeeb-YG and MON 810 thus seem able to provide significant benefits to farmers, consumers and the environment. In addition to a higher yield, use of the Bt technology also lowers use of insecticides; reduces potential

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exposure to insecticide; improves stalk lodging resistance; improves grain quality; lowers levels of mycotoxins; increases numbers of beneficial insects relative to insecticide-treated fields; and provides for greater flexibility in planting time. For Egyptian farmers, such benefits seem to render the switch to use Bt maize an appealing option [4].

In 1999, Monsanto initiated a joint project with the private Egyptian company, Fine Seeds International, for the development, commercialization and distribution of Bt maize in Egypt (see Additional file 1 for a list of additional project partners). From 2005 to 2008, the National Biosafety Committee (NBC) led the risk-assessment and testing process of Ajeeb-YG [1,7]. In 2008, Ajeeb-YG was approved for commercial use, making Egypt the first country in the Arab world to commercialize a biotech crop [2]. As of 2010, Egypt planted 2,000 hectares of Bt maize— an increase from 700 hectares in 2008 [8]. (see Additional file 2 for more details on the development of the Bt maize project).

The issue of trust

However, the development of the Bt maize variety in Egypt presented a number of challenges, primary among them being related to trust. Trust is central to agricultural biotechnology projects driven by public-private partnerships (PPPs) but is often difficult to earn due to the controversy over transgenic crops and public skepticism of multinational companies involved in such initiatives.

This case study focuses on the issue of trust in the conception, management, and development of Bt maize in Egypt. We believe that exploring trust in the context of agricultural development projects fueled by public-private collaboration is a valuable pursuit because it can provide insight to funders, researchers, farmers, and other stakeholders on how trust building can help contribute to success in future agbiotech endeavors.

Methods

Data was collected by conducting a literature review of academic articles, news articles and publicly available project documents of the Bt maize project in Egypt; using direct observation; and conducting semi-structured, face-to-face interviews with 13 stakeholders associated with the Bt maize Egypt project. These stakeholders represented participants from Fine Seeds International; Egypt Biotechnology Information Center; Monsanto; Central Administration for Seeds Application; Agriculture Genetic Engineering Research Institute (AGERI); Agricultural Research Center, Egypt; Agrifoods; and the Faculty of Agriculture (Saba Basha) at Alexandria University, Alexandria. The interviewees also included Bt maize farmers.

Interviewees were identified first by making a list of key individuals associated with the project based on the stakeholders identified within our case study research protocol.

This list was then populated further through snowball sampling by engaging with partners involved in the project and stakeholder informants who were familiar with the Bt maize project in Egypt through the Sandra Rotman Centre's Social Audit Project [9]. Potential interviewees were sent an invitation, which included an explanation of the case study series, to participate in the interview. Those who consented to participate were informed that the interview would be recorded, transcribed verbatim, and then analyzed.

The interview guide included questions on the interviewees' background, their understanding of the project, and their interpretation of the word *trust*. The interview explored perceptions of trust within the partnership and the public, apparent challenges to trust, and observed trust-building practices among the project partners and between the Bt maize project and the public. Finally, interviewees were asked to provide suggestions on how to improve agbiotech PPPs (see Additional file 3 for a list of sample interview questions).

The data from the interviews were analyzed by reading through the transcripts several times, identifying emerging trends and organizing them into major themes in order to create a comprehensive narrative on how trust is understood and built within the project and between the project and the community that it aims to serve.

We received Research Ethics Board (REB) approval for conducting the case study from the University Health Network (UHN), University of Toronto before proceeding with the study. Signed consent was obtained from each participant after providing information on the purpose of the study and stating that the interviews would be recorded.

Results and discussion

Stakeholders' understanding of trust

With the intention of soliciting authentic and holistic perceptions of trust from our interviewees, participants were led into discussing the issue of trust in the context of agbiotech PPPs after an initial question exploring their general understanding of the word *trust*. Overall, trust was predominantly described by participants as essential to the development of meaningful partnerships, a cornerstone of project success, and something that is built over time. Core elements of trust, as explained by interviewees, include transparency; open and honest communication; and respectful interactions among all project partners. Other key components of trust include building a common understanding regarding project goals and intended outcomes, as well as maintaining accountability, of which a central component is the establishment of clearly defined roles and responsibilities.

Based on the results of this study, we have derived five key lessons, from which partners in other agbiotech

PPPs can learn and use as a guide for building and fostering trust.

1. Transparent processes are central to effective project partnerships

The need for transparent interactions to secure trust among members of the partnership was the most dominant theme, particularly with regards to the partnership between Monsanto and Fine Seeds International, the two core private partners in the Bt maize project in Egypt. All participants acknowledged the importance of transparency in some capacity, and recognized that organizations and partners must be open and honest in their interactions if they are to create an environment conducive to building trust. An interviewee involved in raising public awareness about the application of biotechnology stated: *Transparency is most important for this technology, because it's a lot of debates about this technology. So if you're not transparent you will affect others.*

Most participants understood transparency to entail the disclosure and discussion of both the positive and negative aspects of the project. Furthermore, central to transparent processes is the establishment of clearly defined roles, responsibilities and priorities that are recognized and understood by all key players. When each actor has a solid understanding of their roles and responsibilities on an individual level, but especially on an institutional level, it works to enhance transparency and facilitate accountability among partners, both of which were described by participants as key elements of trust.

The particular partnership between Monsanto and Fine Seeds demonstrates the importance of transparency and having clearly defined priorities that are understood by all involved in the initiative. Fine Seeds initiated the interaction with Monsanto by approaching the multinational company to discuss herbicides and the potential for applying Roundup Ready, a top-selling herbicide made by Monsanto, to crops in Egypt. Monsanto initially refused the request, while placing pressure on Fine Seeds to engage in a biotechnology project the development, commercialization and distribution of Bt maize instead. Despite initial conflict in the ideas and vision for Monsanto's role in Egyptian agriculture, Fine Seeds eventually agreed to take on the Bt maize project in Egypt in collaboration with Monsanto.

A unique feature of this particular case study is that only two core partners were responsible for bringing Bt maize to the commercial stages in Egypt. This contrasts with the other cases in our case study series [on trust in agbiotech PPPs] in which many key players contributed to the development and commercialization stages of those projects. While Monsanto, the owner and developer of the technology, was the larger of the two companies with substantial decision-making power regarding the future of biotechnology in Egypt, Fine Seeds was almost exclusively responsible

for mobilizing the project on Egyptian soil. It was Fine Seeds' duty to complete all regulatory processes and procedures leading to the commercialization and subsequent distribution of Bt maize in Egypt. All the same, Monsanto was largely perceived to be the driving force behind Bt maize in Egypt, despite Fine Seeds being the vehicle that mobilized the project from development to distribution. This was cause for some tension within the partnership. A representative from Fine Seeds described the relationship between Fine Seeds and Monsanto as being negatively affected by power imbalances and a lack of shared decision-making processes: *They [Monsanto] are our masters. That is talking in the old, before the revolution mentality. There is the big dictator and the small dictator sitting and meets all of us here. We [Fine Seeds] are the servants; we are the slaves in the private sector or whatever. And when we need anything to move, they need to put their say. So we go and beg and then they come down to our level and they try to listen to us and sometimes they say 'yes.'*

Additional challenges faced in the partnership between Fine Seeds and Monsanto are tied to the reality that decision-making processes in large multinational companies take time. Fine Seeds has expressed their frustration with the timely and costly process through which Monsanto reached an agreement as to how they should proceed with regard to biotechnology in Egypt. It seems that there is a lack of transparency and open and honest communication between the Cairo-based company Fine Seeds International and the multinational company Monsanto. At the time of our study, a participant suggested that Fine Seeds had been relatively uninformed as to where Monsanto's priorities lie regarding the future of Bt maize in Egypt: *In a huge multinational, decision making is very slow, very complicated... Very infrequently do they reach a beneficial decision after a lot of money has been spent on talking. I think that their problem is that they haven't really made up their mind in a business manner on do they or do they not want to be in Egypt. Are they or are they not interested in Egypt? Do they or do they not trust Egypt?*

Our study suggested that there is a clear gap between the visions of each of the core partners driving the Bt maize project in Egypt. There is also a need for respective project goals and priorities to be clearly expressed and shared among partners.

2. Farmer engagement is central to project success: the importance of raising awareness and opening the lines of communication

Closely related to the issue of transparency is the need for improving farmer engagement and raising awareness of the new biotechnology in question and the project in general. Genuine awareness can only be achieved if the project proceeds in a transparent manner, especially within and among higher-level institutions, such as public organizations and private corporations.

Engaging farmers in the research and testing process was also regarded by study participants as an essential tool, in line with the “Seeing-is-Believing” approach to building trust, which involves taking farmers and other community members to demonstration fields to show the increased yield and insect resistance properties of Bt maize over the conventional varieties.

A frequently acknowledged challenge to building trust within the Bt maize project in Egypt was the existing public fear of the new technology; this fear, however, was predominantly due to a general lack of awareness [3,10]. Several interviewees agreed that, when addressing the challenge of limited public awareness and farmer engagement, it is important to first validate, and not simply dismiss, farmers’ concerns. Interviewees indicated that acknowledging the concerns of individuals who are skeptical of Bt maize in Egypt, and then alleviating these concerns using evidence-based practices, will increase the potential to build trust between the project and communities, thus leading to broader acceptance of the new technology. This can only be done if both the advantages and disadvantages of the new technology are discussed openly and honestly among all partners involved, especially with the farmers implementing Bt maize into their current farming practice. On this issue, an interviewee commented: *Because you are talking about biotech crops, then a big big part of it is how to manage it. You have to tell them exactly how to use it. You have to show them how to use it carefully so that you don’t lose the benefits and that sort of thing. So here, the communication part is very important to building trust.*

We believe that allowing the farmers to gain first-hand experience with the technology is an ideal way to gain the farmers’ trust since they are able to see the benefits and risks of the seeds for themselves. For example, field days and extension services, which are intended to engage and inform farmers, were recognized by interviewees as effective tools for building trust in the Bt maize project in Egypt. One representative from the Agricultural Research Centre commented: *So they see with their eyes. As they say, seeing is believing, so this is really where you convince the people. We had a hard time when we started the cotton project. Now the breeders have it... they have been exposed to the potential of the technology. They realize it now so they trust that it is working.*

3. Positive experience with the technology leads to trust: if the seed works, money comes, and trust will be built

It became apparent in our analysis of the data that the quality of the seed, considered in terms of its capacity to improve yields, is a fundamental basis for establishing trust between the farmers and the project. If the seed works to provide financial gain for the farmer, then little else is of concern. One Egyptian farmer who has implemented Bt maize into his farming practice described the

adoption of Bt maize as being purely an effective, results-oriented business decision for him: *I know that it [the seed] is good, so that’s what I use. I am a business man and I work for Fine Seeds and it gives me profit. If I saw any other company other than Fine Seeds that makes more profit, I would go to them.* Similar to the experience of other farmers, his trust in the new product has very little to do with the values and motives of the seed companies involved and everything to do with the ability of the seed technology to deliver on its promised benefits to farmers. In other words, good outcomes attributed to the product itself works to build trust between the community, namely farmers, and the technology. This supports the notion that positive first-hand experience with the seeds creates the foundation on which project partners and farmers can establish trust in the technology and with each other. Therefore, even more important than the motives and ideologies of corporations or organizations involved in the development of the seeds is the *ability* of the seed to deliver in terms of technological capacity.

4. Tainted public perception limits the project’s progress: a need for improved communication and appropriate media response

In line with the need to improve public awareness and farmer engagement is a call for effective means of disseminating information that is accessible to a diverse population. Central to this issue is the media and the various tools used to engage the public. One interviewee from the Egyptian Biotechnology Information Center (EBIC) explained the different methods of communication and forms of media used to engage the public and build awareness of the Bt maize project in Egypt: *We have developed many Arabic materials starting with newsletters– written newsletters with very small messages to the farmers. It can be read by the farmers and all kinds of public. We can also make brochures. I have also developed two books in Arabic. This is the kind of materials distributed.*

Despite these efforts to communicate information related to the Bt maize project in appropriate and creative ways, a common perceived challenge to increasing public awareness of biotechnology in Egypt was the media’s delivery of inaccurate information to the public. While the dissemination of information through the media was acknowledged by participants as a predominant way of raising public awareness of the project, media coverage of Bt maize was also described as a potential way to erode trust if sources of information are unreliable and not backed by scientific evidence. This problem, combined with the fact that the media has overwhelming influence over public perception, presents an important challenge to stakeholders in the Bt maize project in Egypt.

In response to this challenge, participants discussed the importance of ensuring that the media has access to appropriate information and remains fully informed of

the scientific evidence supporting GM crops. Engaging the media in various “Seeing-is-Believing” initiatives, such as field days and workshops similar to those used to engage farmers, helped to ensure that the dissemination of accurate information regarding agricultural biotechnology reaches communities. On this, a scientist with one of the research institutes in Egypt commented: *We have told them [the media] exactly what we do in order to assess the acceptability and risks. And it was very good. They [the media] have embraced the technology itself.*

Participants conveyed that effective engagement of the media will allow reliable information regarding agbiotech projects like Bt maize in Egypt to reach the public, thereby heightening awareness, improving acceptance, and establishing trust in the project. A scientist in particular stated: *I think the most difficult one is the media. And the media play the important role in launching the biotechnology in any country, because the people in media are not specialists in biotechnology. They will hear from you and they will also hear from others. So you have to deal with them honestly and inform them step by step by any development and by knowledge. When they are informed, they can write well and they can discover right and wrong.*

Furthermore, some interviewees recognized that changing public perception involves communicating information in a way that is easily understood. When sharing knowledge, one must give heed to the pre-existing knowledge and level of education of a given audience. One interviewee expressed the importance of framing the concept of genetically modified organisms (GMOs) and risk assessment of biotechnology initiatives in a more positive light by using terms that do not carry negative connotations. An example of this would be using the term “safety assessment” rather than “risk assessment” to describe certain regulatory procedures. An interviewee describes the importance of this approach in building trust: *There are a lot of things done for safety. I would rather talk about safety assessment because when you talk about risk, people think there is a risk and that sort of thing. That these things go through a rigorous procedure before they do come out [will] build this trust, as you say, to the public.*

Such choice of words (i.e., using *safety* over *risk*) decreases susceptibility to further skepticism, which may build trust and, in turn, facilitate public acceptance of the technology. Moreover, establishing partnerships can help uplift the reputation of one company through their association with another. One interviewee, for example, reported that Fine Seeds’ ability to maintain a solid reputation in Egypt has improved the public’s perception of Monsanto and overall approval of the partnership and project. The public—more specifically, the farmers—have placed their trust in Fine Seeds and are therefore able to

remain confident in Fine Seeds’ partnership with Monsanto, despite initial hesitation to accept Monsanto as a trustworthy corporation.

5. The political climate cannot be ignored: where do public-private partnerships stand in the context of the new Egypt?

Perhaps the most important issue, unique to the Egyptian case and highly relevant to trust building in PPPs, is the recent uprisings that spread throughout the Arab world—the revolutionary wave of which is referred to as the “Arab Spring”—just after which this study was conducted (in the summer of 2011). Given the events that have transpired in Egypt, people are still adjusting to the new political climate, especially since the government plays an important role in facilitating partnerships [11].

A major challenge to the project, as indicated by participants, was the public image of the multinational seed company Monsanto and its largely contentious reputation preceding its engagement in Egyptian agriculture. The public’s tainted perception of Monsanto is similar to their view of many private companies and businesses. In Egypt, the private sector is viewed by the public as corrupt, primarily due to the inner workings of the former Mubarak regime. One interviewee commented that the former Egyptian government would favor a few select businessmen, who later became business tycoons by way of government favoritism: *Those people who accepted such givings cannot be trusted by the people. And so even us little businessmen who cannot be discovered as corrupt or may think that we are honest, we also suffer. And this is why we don’t even say the word ‘business.’ We don’t like to be called ‘businessmen’ because it has a bad connotation.*

Evidently, the level of corruption in the government and a lack of transparency in Egypt’s old regime lead to a lack of trust in the private sector. In line with the old regime, the private sector continues to view the public sector as corrupt; likewise, the public sector maintains a tainted image of private Egyptian companies. A representative from Fine Seeds acknowledged that more trust is needed between the two sectors, and that the trust-building process will take time: *So again, it is hard for us when we go to the public sector. We know that they are corrupt but in turn they think that we are also very corrupt. More trust [is needed]. It will take some time.*

According to the farmers’ account of the results of the Bt maize field trials in Egypt, there is no doubt that the seed functions as expected. Yet, one interviewee verified that the issue is not a question of the technology and its viability; instead, it is a question of the political climate and whether or not it will permit the project to progress through the commercialization process. One interviewee expressed his concern about this issue, particularly emphasizing that the public sector should respond with increased transparency, accountability, and faith in their private partners in the wake of the old regime: *I don’t*

think the question is a technical question, I think it is a political question. I think that the people in public organizations will need—and this will happen diagonally—will need a change of attitude. And will need to agree on a common pathway, a common direction for the good of the people of this country. And from my point of view, they need to be more transparent; they need to be accountable; and they need to believe more in the credibility of the private [sector].

In line with the need to solve tensions between public and private actors is the need to establish common ground among the partners so they can engage in a more unified relationship. This means core project partners—like Monsanto and Fine Seeds, in the case of Egypt—must work together to maintain a consensus on project goals and intended outcomes. It is important for both sectors to converge on a common goal as a means for establishing trust, as described by one interviewee: *As I said, you [public and private sector] have to first talk together and understand each other and feel that you are working towards one goal that you have in mind. And once you have decided that you trust each other, then you go to the community to convince them. So here you have to first get together and understand each other and focus on what you want in a project or whatever product.*

In the same vein, it is important for the public institutions and private corporations involved in the project to agree upon and communicate the same message to the public regarding the agricultural biotechnology in question. If the partnership sends out mixed messages to the public, it may delegitimize, and therefore impede trust in, the project, as described by one interviewee: *It goes for both the public and the private sector. They have to work together when they are addressing the public or the community or whatever. One by themselves will not be enough. They have to both agree on how. If they are going to the media, at least you are talking the same language or saying the same thing, not saying something else that is a contradiction. Contradictions will make people not believe and then there is a problem there with trust.*

There is a clear need for a better alignment of goals within the public and private sector. Findings suggest that each contributing party cannot simply work in parallel on the same project with minimal interaction. There must be enhanced integration and engagement between public and private partners. This particular recommendation will perhaps be the most difficult to address in light of the recent uprisings and current political situation in Egypt. The obvious challenge rests in building an effective partnership between two distinct sectors that have historically not trusted each other. However, Egyptian scientists hope that the new regime will have favorable implications for the future of biotechnology development in the country [12].

Conclusions

The predominant theme drawn from the interviewees' responses is the issue of transparency – particularly, the need for public institutions and private corporations to establish a clear understanding of each partner's respective roles, responsibilities and priorities. Working transparently and engaging in open and honest communication with each other and with the public were found to be key elements of project success. Central to this, and specific to the partnership between Fine Seeds and Monsanto in Egypt, is the need for stakeholder priorities and intentions to be clearly communicated to all partners. This issue is intricately related to the need for improved farmer engagement and elevated levels of awareness on all fronts surrounding agricultural biotechnology, which depends primarily on the use of effective communications strategies. It also includes engagement of the media to ensure that they report to the general public information that is backed by scientific evidence. But most important to the case of Egypt is the effect of the current political climate on the success of a project that engages both the public and private sector. The revolutions sweeping the Arab world, although exciting for Egypt, render the establishment and maintenance of trust in any context challenging. This is especially difficult for two different sectors trying to engage in collaborative initiatives. Furthermore, although the commercialization of Bt maize in Egypt appears to have been successful, it did not meet a number of project goals. First, the Bt maize was only commercialized for animal feed and not human consumption. Second, the project was only allowed to introduce the gene to yellow maize—which, in comparison to white maize, is unpopular and not widely grown. Third, the adoption rate of Bt maize in Egypt has been slow and it is still beset by challenges related to trust. There is reason to believe that the current political situation will dictate the ability of public institutions and private corporations to engage in trusting partnerships. The question remains: how can a nation that once had limited trust in governmental institutions regain trust in the current state of affairs, and what implications does this have on collaborative initiatives such as the Bt maize project in Egypt that engage both the public and private sector?

Additional material

Additional file 1: Bt maize Egypt project partners.

Additional file 2: Stages of development in the Bt maize Egypt project.

Additional file 3: Sample questions from the interview.

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Authors' contributions

Study conception and design: OCE. Data collection: OCE. Analysis and interpretation of data: OCE. Draft of the manuscript: OCE and ASD. Critical revision of the manuscript for important intellectual content: OCE and ASD. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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