"Reciprocal Technologies: Enabling the Reciprocal Exchange of *Voice* in Small-Scale Farming Communities through the Transformation of Information and Communications Technologies"

By Eugenio Tisselli

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Committee in Charge:

First supervisor: Dr. Jill Scott, Zurich Hochschule der Künste and the University of Plymouth, UK

Second supervisor: Dr. Angelika Hilbeck, ETHZ Zurich

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Author's Declaration:

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Graduate Committee. Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment

Relevant cultural and scientific conferences were attended at which I presented my research; several keynote talks were given were I presented my work and several papers and book chapters were prepared for publication.

Abstract

This dissertation claims that the reciprocal exchange of *voice*—an element for constructing community and strengthening political recognition—may be fostered in small-scale farming communities by (1) the appropriation and transformation of information and communications technologies, (2) artistic intervention, and (3) cross-community research. This study contributes to participatory research methodologies, particularly those that seek to tackle the diverse challenges faced by small-scale farmers from a broad, complex perspective.

The main issue identified in this dissertation is as follows: The hegemony of economic behaviors, which stands as a cornerstone of neoliberal capitalism, constitutes the latest stage of a historical process in which the *voices* of small-scale farmers seem to have been progressively and systematically silenced, their traditional practices largely invalidated, and their reciprocal forms of social, political, and economic organization marginalized.

The purpose of this study was to explore whether an open-ended, sociotechnical methodology could be designed and applied in small-scale farming communities with the aim of strengthening their reciprocal practices while amplifying the *voices* of their members. The author's research addressed the question of how the role of information and communications technologies can contribute to the creation of enabling environments in which subsistence farmers may exercise their own values and make their *voices* heard. Another goal was to study whether the reciprocal exchange of *voice* could relate to the construction and dissemination of a knowledge commons and improve the resilience of small-scale farmers in the context of complex and pressing challenges such as anthropogenic climate change. Consequently, the ERV (Enabling Reciprocal Voice) Methodology was developed and applied in small-scale farming communities in order to respond to the questions of this study. The ERV Methodology sought to redefine the modes of usage of information and communications technologies in order to help communities establish a shared communicational praxis and strengthen their reciprocal relations. The ERV Methodology stands in contrast with the technological determinism found

in the purely *solutionist*, short-term initiatives that are generally implemented in small-scale farming communities. Instead of offering rapid solutions to isolated problems, the ERV Methodology sought to consolidate the social networks of farmers through online and offline interaction.

The case studies examined in this dissertation were carried out in two small-scale farming communities in Tanzania and Mexico. Following the ERV Methodology, mobile phones and the Internet were used by farmers in those communities as tools for the collaborative creation of a knowledge commons focused on local agriculture. It was found that the ERV Methodology, carried out as artistic intervention, may encourage technological appropriation, induce reciprocity, and amplify *voice* under certain sociotechnical conditions. These findings suggest that such a methodology might benefit farmers by becoming a significant aid to increase their resilience and their capacity to face complex challenges in the longer term. However, another conclusion was that the ERV Methodology should be applied carefully, with a strong awareness of the local context, and that greater efforts must be made in order to integrate other communities, such as local authorities and scientific researchers, into the reciprocal dynamics enabled by the methodology.

Keywords: reciprocal voice, information and communications technologies, small-scale farming, knowledge commons, socially engaged art, sociotechnical methodology

Table of Contents:

List of Figures:

Tanzania, on May 1, 2011. The voice recording that accompanies this picture was translated as follows:

"This is maize that I grew on terraces after getting advice from my colleague. I got advice on cultivating on terraces during the winter and not in the summer as previously. Maize has begun to dry up and is ready to eat."

- *Figure 23.* Mr. Shabani's first successful maize harvest. He took this picture after learning how to cultivate maize properly. Published by Mr. Haeshi Shabani, a participant of *Sauti ya wakulima*, in Bagamoyo, Tanzania, on June 28, 2011. The voice recording that accompanies this picture was translated as follows: "This is maize that I grew on terraces after getting advice from my colleague. I got advice on cultivating on terraces during the winter and not in the summer as previously. Maize has begun to dry up and is ready to eat."

- *Figure 24.* Mr. Haeshi Shabani interviews Mrs. Renalda Msaki during a training session at the Chambezi Agricultural Station. Photo by Juanita Schlaepfer-Miller, Chambezi, Tanzania, 2011.

- *Figure 25.* In the audio clip that corresponds to this picture, Mr. Ally Issa explains why he considers himself a successful mango grower. To illustrate, he asked his three little daughters to artfully pose under a mango tree. Published by Mr. Ally Issa, a participant of *Sauti ya wakulima*, in Bagamoyo, Tanzania, on December 21, 2012.

- *Figure 26.* Mr. Ally Issa holding a phone in his hand. In the corresponding audio clip, he interviews a farmer about her problems with birds that destroy crops. Published by Mr. Ally Issa, a participant of *Sauti ya wakulima*, in Bagamoyo, Tanzania, on June 21, 2012.

- *Figure 27.* Mrs. Vitaliana and her son receive training on how to use the smartphone during a session in Santa Ana. Photo by Joana Moll in Santa Ana, Santa María Tlahuitoltepec, Mexico, 2012.

- *Figure 28.* Mr. Odilón discusses the visual calendar created with the images published by the participants of Los ojos de la milpa during an evaluation meeting in Santa Ana. Photo by Joana Moll in Santa Ana, Santa María Tlahuitoltepec, Mexico, 2012.

- *Figure 29.* In this picture, a farmer in Tlahui who created an improved plow

by assembling different parts of discarded metal artifacts is interviewed by a participant of *Los ojos de la milpa*. Photo published by a participant of *Los ojos de la milpa* in Santa María Tlahuitoltepec, on April 11, 2012.

List of Diagrams and Charts:

List of Tables:

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Introduction.

The advent of industrialized agriculture gave rise to the food systems that we know today. By relying on technification and trade, these systems have significantly increased food production and expanded its market globally. However, they have also compromised local, regional, and even global ecosystems and have largely denied the *voices* and practices of small-scale farmers, often pushing them into social exclusion.[1] **This research seeks to explore this critical issue, and its main premise is that the *reciprocal* exchange of *voice* can be encouraged in small-scale farming communities by the transformation of information and communications technologies, artistic intervention, and *cross-community research*.** In this dissertation, I will attempt to support this premise by constructing a theoretical context for *voice*, *reciprocity*, and the transformation of technology, formalizing a new methodological approach that can be applied to artistic, *cross-community* interventions in small-scale farming communities, and also by analyzing the outcomes of two practical case studies. But how may the value of *voice* and the practice of *reciprocity* be encouraged within communities of subsistence farmers, and why is it relevant? What is the advantage of attempting to do so as artistic interventions within *cross-community research*?

Throughout this research, reciprocity will become a theoretical vector that will traverse different disciplines and fields of practice. I will focus on identifying the importance of *voice* and *reciprocity* in the process of building social values and practices that may pose an alternative to self-interested competition, which largely prevails in contemporary societies. Could these dominant values be understood as the basis of a political hegemony that tends to silence the *voices* of people and communities, putting them at risk of exclusion? And how might the value of *voice*, together with the practice of *reciprocity*, be interwoven into the notion of *reciprocal voice*? Could *reciprocal voice* become a counter-hegemonic tool for the political presentation of alternative subjectivities and, at the same time, be considered as a

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1   Social exclusion may be broadly defined as a complex process in which various forms of exclusion may be combined: participation in decision making and political process, access to employment and material resources, and integration into common cultural process (Byrne, 2005; Madanipour et al., 1998). Social exclusion, whether mild or severe, often implies the silencing of those who are excluded: their *voices* are seldom heard in their own political environment, much less beyond it.

commons wherein knowledge can be shared? What is the relevance of *voice* and *reciprocity* in subsistence farming communities? As I attempt to answer these questions, I will investigate whether encouraging *reciprocal voice* in such contexts may effectively strengthen the long-degraded political standing of small-scale farmers.[2]

How does the increasing pervasiveness of information and communications technologies affect *voice* and reciprocity? I will analyze the social, political, and cultural role of technology, particularly information and communications technologies, and will examine whether its transformation, when carried out as a conscious, communal process, may contribute to shift its embedded values. Information and communications technologies are being increasingly applied to improve the livelihoods of small-scale farmers, and it is commonplace to evaluate those technologies on the basis of their problem-solving capacities. But can they also be appraised in less functional terms, such as their potential to induce a positive shift in social values, perhaps towards more reciprocal ones?

In order to explore these questions in a practical way, I will propose a new sociotechnical methodology aimed at guiding interventions that seek to activate communicational environments in which *voices* may be amplified and exchanged through *reciprocal* practices. Through practical case studies, I will examine whether this methodology may effectively contribute to engage small-scale farmers in open-ended, participatory processes of socialization, and whether the technologies involved in the methodology may be fruitfully appropriated by farmers so that they may effectively respond to their interests, needs, and aspirations.

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2   In this dissertation, the qualifier *small-scale* will be applied to farmers who carry out their activities in less than 2 hectares of land, whose production is largely destined to subsistence, and who significantly depend on traditional or locally held knowledge. According to the Food and Agriculture Organization of the United Nations, there are more than 570 million farms in the world, of which 90% are run by small-scale farmers and rely primarily on family labor. It is estimated that these small farms produce about 80% of the world's food, although they occupy only 12% of the available agricultural land (FAO, 2014).

0.1 Structure of this dissertation.

This dissertation is structured as a series of chapters in which the notion of *reciprocity* will gradually become more concrete. In the first two chapters, the theoretical framework will be traced by relating reciprocity to *voice* and technology. In chapter 3, I will analyze how large-scale, industrialized models of food production have affected more reciprocal ones, and will discuss the relevance of reciprocity in the livelihoods of small-scale farming communities. Chapter 4 will constitute a study of how the application of development programs based on information and communications technologies in small-scale farming communities may affect reciprocity. Finally, the sociotechnical methodology I have developed, together with its correspondence with two practical case studies, will be described and analyzed in chapter 5.

Chapter 1: Identifying the roles of *voice* and reciprocity in the construction of a community and within the field of politics.

- Can reciprocity be regarded as a form of social interaction that escapes self-interested economic values and behaviors?

- Is it possible to understand *voice* as a form of reciprocal exchange?

- Can *reciprocal voice* contribute to the production of a knowledge commons?

Chapter 2: Analyzing how information and communications technologies may be transformed so that they can strengthen *reciprocal voice*.

- How do technologies affect the sphere of politics, and what is their effect on *voice* and reciprocity?

- May the standard modes of usage of information and communications technologies be transformed so that they can enhance reciprocal practices and the value of *voice*?

Chapter 3: Discussing the relationship between large-scale, industrial agriculture and the reciprocal practices which are often found within small-scale farming. Identifying how *voice* and reciprocity contribute to the resilience of small-scale farmers.

- Has industrialized agriculture tended to silence the *voices* and marginalize the reciprocal practices of small-scale farmers?

- Can reciprocal values and practices, which have persisted in communities of small-scale farmers despite industrialization, become significant factors for achieving more resilient agricultural models?

Chapter 4: Examining how information and communications technologies are used as tools to improve the livelihoods of small-scale farmers.

- Do technology-driven development initiatives carried out in small-scale farming communities reproduce the values found in large-scale models of food production?

- Can these initiatives present potential risks to small-scale farmers because of the ways in which they are designed and implemented?

- How can such initiatives be reshaped so that they may encourage reciprocity?

Chapter 5: Formalizing a methodology to encourage *reciprocal voice*, and describing and analyzing the two case studies which constitute practical basis of this dissertation.

- Is it possible to design a sociotechnical methodology that may effectively strengthen *reciprocal voice* in small-scale farming communities through open-ended methods and principles?

0.2. Socially engaged artistic interventions as contextual background.

The methodologies and practices presented in this dissertation were applied by following strategies of artistic intervention. I consider the different aspects of this dissertation as forms of artistic research, practice, and intervention, linked to social practices in the arts. In the following paragraphs, I will attempt to justify why.

The artistic approach of this dissertation tries to align itself with the spirit of what artist Jeremy Deller meant when posited: "I went from being an artist who

makes things to being an artist who makes things happen."[3] In this spirit, my aim is to situate the theoretical, methodological, and practical aspects of this dissertation within different fields, particularly those from which initiatives aimed at improving the livelihoods of small-scale farmers might emerge. However, I believe that the methodological and practical aspects of this dissertation may contribute to artistic practices, especially those that intentionally apply the potential of art to the articulation of counter-hegemonic social strategies,[4] or those that seek to transcend mere aesthetic pursuits[5] in order to bring about concrete changes and shifts in specific communities. Such practices have been described by art historian Claire Bishop as a *social turn* in the arts: an expanded field of post-studio practices in which art becomes "a form of experimental activity overlapping with the world" (Bishop, 2012, p.44). This expanded field of art is also known as *Socially Engaged Art*, or *social practice* (Helguera, 2011).[6] The practice of socially engaged art is generally aimed at the creation of platforms or networks that facilitate the participation of others, in which five constitutive elements can be identified:

1. The construction of a community or temporary social group through a collective experience.

2. The construction of multi-layered participatory structures.

3. The role of social media in the construction of community.

4. The role of time.

5. Assumptions about audience

(Helguera, 2011).

By opening up spaces for "radical imagination" that reach beyond small-scale initiatives, socially engaged art takes an explicit stand, or provokes others to do so, and actively seeks to bring about change (Malzacher, 2014, p.17). The intention of

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3   Quoted by curator Nato Thompson (Thompson, 2012, p.17)
4   Political theorist Chantal Mouffe argued that art practices might contribute to a counter-hegemonic challenge to dominant political regimes by acknowledging the centrality of values in their construction (Mouffe, 2014). Therefore, art that is aware of implicit hegemonic values might attempt to shift them through emancipatory practices.
5   According to media theorist Boris Groys, the aesthetic attitude in art presupposes the production of art whose political potency is undermined and subjected to its passive consumption. Consequently, he argues that, in order to fully accomplish its function of making visible realities that are generally overlooked and produce *life* itself, art should be understood in terms of *poetics* (production, process) instead of aesthetics (Groys, 2010).
6   Both Helguera and Bishop have noted that the exclusion of *art* in the term *Social Practice* may symbolize a growing discomfort or even a loss of faith in the arts, largely provoked by its increasingly strong ties to speculation in monetized markets (Helguera, 2011; Bishop, 2012) However, in this dissertation, I will prefer to use the term *socially engaged art*.

socially engaged art is to move beyond representation and aesthetics in order to effect changes and shifts in the world. This resonates with what artist Tania Bruguera has called *Useful Art*. Useful Art "is not art to look at, but art to do something with…. (it) is not art for institutions, but art for the people." (Bruguera, 2014, p.299) However, art critic Florian Malzacher argued that such claim for *usefulness* may be problematic, since "it seems to agree with the social democratic instrumentalization of art as a mere tool for social work and as an appeasement strategy" (Malzacher, 2014, p.25).

How can the instrumentalization of art be avoided without giving up its *usefulness*? By following the principles of socially engaged art, the artist may become a "provider of frameworks" which require social participation (Helguera, 2011, p.54). However, as architect Markus Miessen warned, light interpretations of *participation* often become methods of placation, rather than real processes of transformation (Miessen, 2010).[7] In order to support his argument, Miessen claimed that participation had become a *catchphrase* subjected to overuse, particularly in politics (Miessen, 2010). The term *participation* tends to be founded in a rhetoric which references the principles of democracy, but may actually serve as an excuse to mask anti-democratic practices. Precisely because such a rhetoric has been associated with political initiatives based on the top-down imposition of merely nominal forms of participation, the usage of the term has come to be related to the placation of truly democratic aspirations, rather than to their fulfillment (Miessen, 2010). Consequently, throughout my practice, I have tried to be constantly aware of the potential risks that the instrumentalization of art and participation may pose, and therefore I have strived to develop and follow a truly participatory methodology that allows participants to reshape its goals and rules.

Furthermore, certain forms of participation in arts and politics tend to be based on consensus rather than conflict, as exemplified in today's culture of social

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7   Markus Miessen claimed that *participation* had become a *catchphrase* that has been overused. According to Miessen, the term "participation" tends to be founded on a rhetoric that references the principles of democracy. However, precisely because such a rhetoric has been associated with political initiatives based on the top-down imposition of merely nominal forms of participation, the usage of the term has come to be related to the placation of truly democratic aspirations, rather than their fulfillment (Miessen, 2010). Throughout this dissertation, I will provide several examples of how merely rhetorical participation might become a means for masking the interests of those who impose it and for potentially placating opposition.

networking, and therefore produce multiplied resonances rather than new knowledge (Miessen, 2010). In chapter 2 I will illustrate how digital media art has actively challenged and critiqued consensus as the default mode in our network cultures. However, more critical *voices* are needed that may introduce dissonance in environments where superficial, consensus-based participation prevails, in order to circumnavigate social and political predictability—and perhaps instrumentalization as well. I claim that such *voices* might be raised by the artists, regarded by Miessen as *critical outsiders* who, because of their very detachment, might trigger truly participatory processes (Miessen, 2010).

But this is not the only view on participation in the art context. Philosopher Marina Garcés proposed that only through *implication* may reality be transformed and claimed that art can be a process by which society thinks about itself, implying that art must be made from inside of society, rather than from the critical distance of an outsider (Garcés, 2013).

Yet, these two viewpoints may be brought together: socially engaged artists may choose to become critical outsiders who, at the same time, may be strongly committed to encouraging participatory processes that seek to bring about social change. Such a description fits the approach that, as a digital media artist, I have explored throughout this study.

0.2.1. Examples of socially engaged interventions.

In the following paragraphs, I will introduce examples of works that embody values and principles that resonate with the socially engaged artistic interventions of this research, and therefore may help to trace its contextual background. The fact that not all of these works were carried out as artistic interventions reveals the thinness of the borders between socially engaged art and other fields of knowledge and practice. Accordingly, in this dissertation I will attempt to situate my work precisely at the fine edge between artistic intervention and *cross-community research*.

Map Kibera: *Map Kibera[8]* is a collaborative mapping project carried out by the inhabitants of Kibera, Nairobi. In 2009, a group of young people created the first free and open digital map of their own community. After the map was created, a citizen reporting initiative called Voice of Kibera[9] used it as a web-based platform aimed at giving "collective global voice to Kibera residents by aggregating local citizen reports." *Voice of Kibera* is based on *Ushahidi,[10]* a mobile and web-based software platform developed in Kenya and used globally to collect and visualize data using online geographic interfaces.

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8   MapKibera: http://mapkibera.org (retrieved 23.03.2015)
9   Voice of Kibera: http://voiceofkibera.org/ (retrieved 23.03.2015)
10   Ushahidi: http://www.ushahidi.com/ (retrieved 11.08.2015)

Figure 1. The collaborative map created by the inhabitants of Kibera painted on a wall of their neighborhood. Photo published by the Map Kibera Team on the blog of the Map Kibera Trust, on February 12, 2013.

Figure 2. Participants and facilitators of Map Kibera using GPS devices to map the neighborhood. Photo published by Primoz Kovacic, Program Director of the Map Kibera Trust, on his personal blog, on September 10, 2011.

Figure 3. The web interface of Voice of Kibera. Image retrieved from the website http://www.crowdsourcing.org/site/voice-of-kibera/voiceofkiberaorgmain/6390 on March 23, 2015.

Rhizomatica[11] is a communal mobile telephony initiative that responds to the lack of affordable and sufficient access to mobile phone coverage in communities at risk of social exclusion. According to *Rhizomatica*, their mission is to "increase access to mobile telecommunications to the over 2 billion people without affordable coverage and the 700 million with none at all." *Rhizomatica* successfully carried out a project in Talea de Castro, Oaxaca, where members of the community currently operate their own mobile network.

Figure 4. Members of Rhizomatica raising an antenna used in the communal mobile telephony initiative in Talea de Castro. Photo by Rhizomatica, published on their website in 2013.

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11   Rhizomatica: http://rhizomatica.org/ (retrieved 23.03.2015)

Figure 5. A member of Rhizomatica teaches inhabitants of Talea how to use a mobile phone. Photo by Rhizomatica, published on their website in 2013.

Iconoclasistas[12] is an Argentinean collective that combines graphic art, workshops, and collective research with different communities around the world to produce maps and other resources for free circulation, appropriation, and use. Through collaborative mapping, the work of *Iconoclasistas* aims at strengthening communication, forging solidarity networks, and promoting practices of collaboration and resistance.
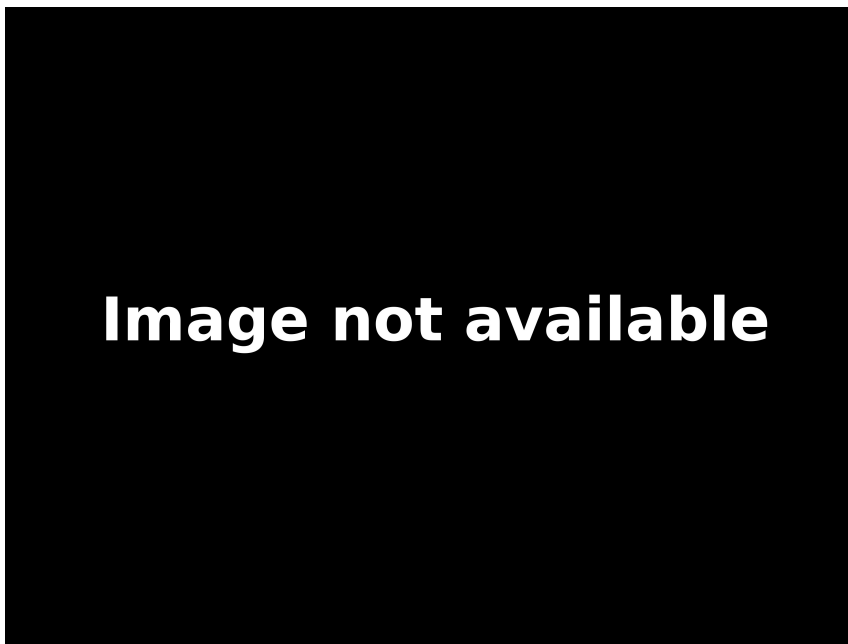
Figure 6. A workshop led by Iconoclasistas. Photo by Marcelo Expósito, MACBA, Barcelona, Spain., 2014.

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12   Iconoclasistas: http://www.iconoclasistas.net/ (retrieved 23.03.2015)

Voz Alta[13] is a site-specific installation by Mexican artist Rafael Lozano-Hemmer. It was installed in 2008 at the Tres Culturas Square in Tlatelolco, Mexico City, the site where the tragic massacre of students at the hands of Mexican armed forces took place in 1968. During ten nights, anyone who visited the square could use a megaphone to speak out publicly. The installation not only amplified the voices of visitors, but also transformed the waveform of the voice signals into intermittent light emitted by four searchlights. Voices were also broadcast on a well-known local radio station, and archived in a database (Benítez, Argüello, 2014).
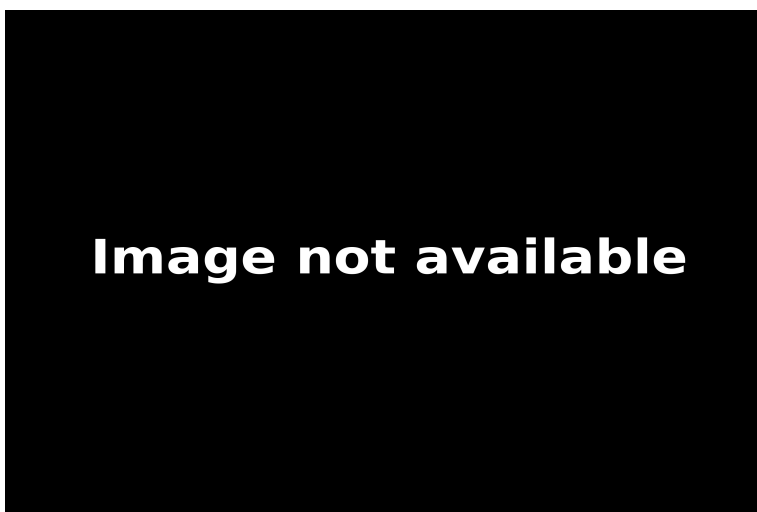
Figure 7. The Voz Alta installation at the Tres Culturas Square in Tlatelolco. Photo by Rafael Lozano-Hemmer, Mexico City, Mexico, 2008.
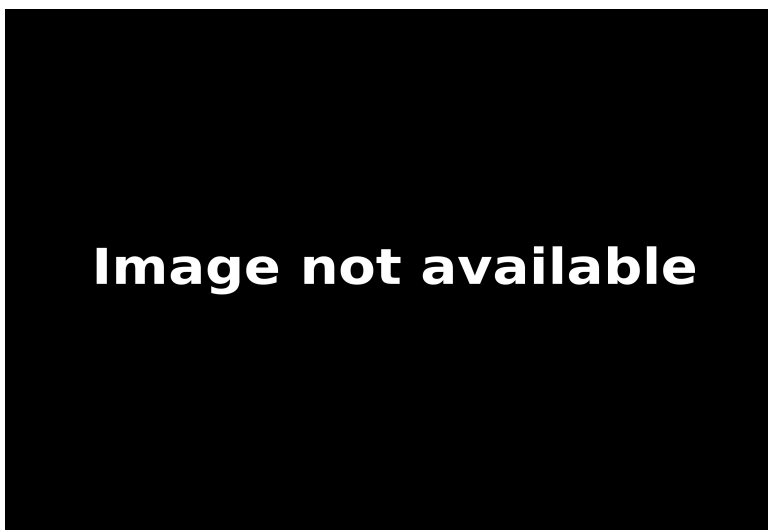
Figure 8. A participant uses the megaphone of the Voz Alta installation to make his voice heard. Photo by Rafael Lozano-Hemmer, Mexico City, Mexico, 2008.

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13   Voz Alta: http://www.lozano-hemmer.com/voz_alta.php (retrieved 23.03.2015)

These works present a number of features which are relevant to this dissertation. *Map Kibera/Voice of Kibera*, *Rhizomatica*, and *Iconoclasistas* directly address the common concerns of communities at risk of exclusion by allowing members of those communities to produce forms of knowledge that may be considered as a *commons*. *Map Kibera/Voice of Kibera*, as well as the projects carried out by the *Iconoclasistas* collective, regard their participants as the generators of the content, which is then made available publicly. *Iconoclasistas*, in particular, focuses on activating collaborative practices aimed at strengthening the political standing of specific groups or communities. Such practices are carried out collectively, following appropriable, replicable methodologies that have been freely released to the public. The project *Voz Alta* seeks to encourage public participation, aimed at amplifying the *voices* of those who wish to express their political views in a public space.

In these works, several kinds of technologies play a significant role. *Map Kibera/Voice of Kibera* uses mobile platforms as agents for the collaborative creation of content and map-making, while *Rhizomatica* attempts to appropriate and adapt those technologies in order to satisfy the needs and values of communities at risk of exclusion. The projects of *Iconoclasistas* involve a diversity of technologies, including non-digital ones. However, their results have been widely disseminated through the World Wide Web. *Voz Alta* does not make a specific usage of digital technologies; however, the voices of those who took part in the installation were broadcast via radio and stored in a digital database.

Although only *Voz Alta* and the mapping projects by *Iconoclasistas* have been explicitly qualified as artistic interventions, all of these projects are strongly related to the socially engaged research I have sought to carry out. I have chosen these projects to contextualize my own work because they resonate with my main premise of encouraging the reciprocal exchange of *voice* in specific communities through a transformative usage of information and communications technologies.

0.2.2. The Megafone project.

The *cross-community* artistic interventions in this dissertation evolved from my collaboration in the Megafone project between 2004 and 2010.[14] The Megafone project consisted of a set of socially engaged artistic interventions and was initiated and directed by Catalan artist Antoni Abad. The project sought to amplify the voices of different communities at risk of exclusion by gathering groups of people from those communities and providing them with mobile phones and a web page to be used jointly as a platform for the public expression of their views and opinions. The people who participated in the different episodes of the Megafone project used mobile phones to capture images, voice recordings, and videos of their daily lives, and published them on a collaborative web page. I developed the software for the Megafone project at a time when transmitting multimedia contents directly from a mobile phone to a web page had just started to become technically possible, and therefore could be considered as a highly innovative endeavor.

Because the capabilities of mobile phones developed quickly, mobile data networks were rapidly deployed worldwide,[15] and the Megafone project evolved at the same pace as those technologies. In 2005, for instance, GPS modules first became available as external accessories to be used with advanced mobile phones.[16] In that same year, a Megafone project titled canal*ACCESSIBLE engaged a group of handicapped people in the creation of a collaborative map about physically inaccessible places in Barcelona, Spain.[17] Participants used wheelchairs to move around the city and carried the mobile phones and the GPS modules with them.

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14 The Megafone project: http://megafone.net (retrieved 24.03.2015)

15 The first mobile phone with an integrated camera was the Sharp J-SH04, marketed in 2001 in Japan. By the end of 2003, over 80 million camera phones had been sold worldwide. The possibility of sending large data packets (such as image files) over mobile networks became a reality in the year 2000, when the first commercial GPRS (General Packet Radio Services) network was launched. These technical developments were very recent when the Megafone project started, and very few initiatives (artistic or otherwise) had taken advantage of them at that time. Sources: http://www.digitaltrends.com/mobile/camera-phone-history/, http://www.gsma.com/aboutus/history (Both retrieved 24.03.2015)

16 Some of the first commercially available GPS modules which could communicate with mobile phones using the Bluetooth protocol were marketed in 2005. The Nokia LD-3W wireless GPS receiver modules, used in the Megafone project, worked together with the most advanced phones of the same brand, such as the Nokia 6600. Shortly after these devices were marketed, mobile phones with integrated GPS modules became widely available and subsequently replaced the external modules used in early Megafone interventions. Sources: http://www.cnet.com/products/nokia-wireless-gps-module-ld-3w-gps-receiver-module/specs/, http://www.gsmarena.com/nokia_6600-454.php (Both retrieved 24.03.2015)

17 canal*ACCESSIBLE (renamed as BARCELONA*accessible): http://megafone.net/barcelona/about (retrieved 24.03.2015). In 2006, canal*ACCESSIBLE won the prestigious Golden Nica Award in the Digital Communities category at the Prix Ars Electronica contest. Source: http://archive.aec.at/prix/#8011 (retrieved 24.03.2015)

During the course of their daily lives, they took pictures of the challenges they found along their paths. These pictures subsequently appeared at their respective geographical locations on an online map,[18] thanks to the latitude and longitude data provided by the GPS. After three months of activity, the final result of canal*ACCESSIBLE was a map that included more than 3,500 obstacles to mobility identified by the participants.[19]
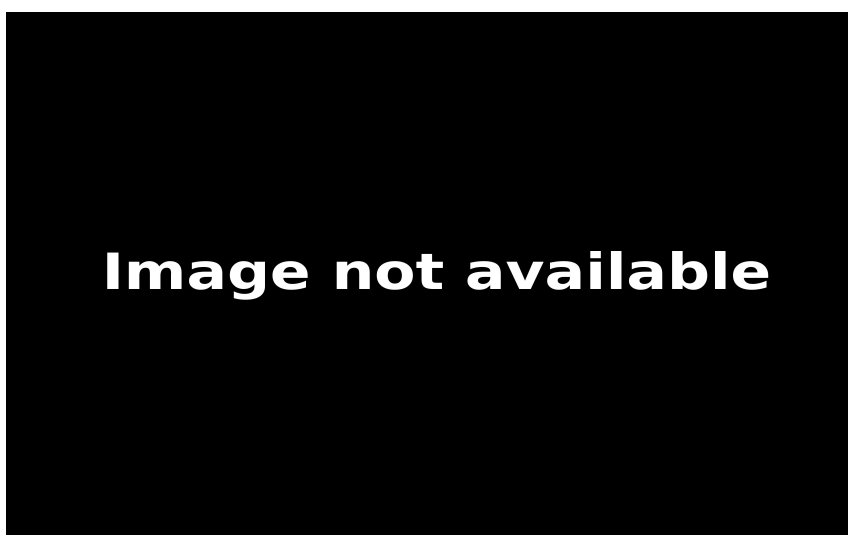
Figure 9. Participants of canal*ACCESSIBLE using smartphones and GPS modules. Photo by Antoni Abad, Barcelona, Spain, 2006.

18 Although Google Maps, the popular web-based geographical interface, was launched in February 2005, an online geographical interface provided by the Cartographic Service of the Municipality of Barcelona was used in the canal*ACCESSIBLE project. However, subsequent Megafone interventions used the Google Maps service.
19 The collaborative map created by the participants of canal*ACCESSIBLE is available at http://megafone.net/INFO/files/pdf/accessible_map.pdf (retrieved 17.04.2015).
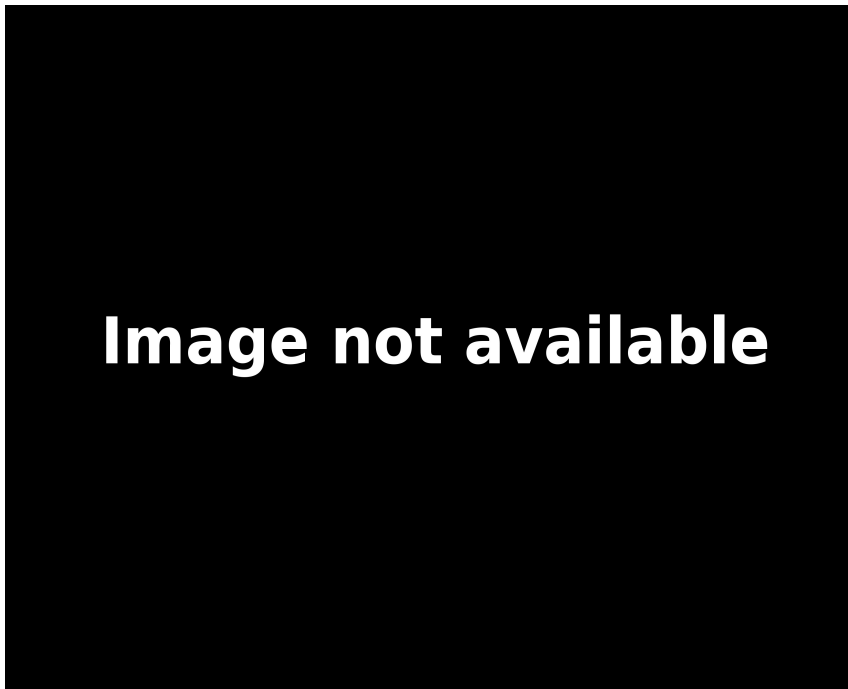
Figure 10. The printed version of the map created by the participants of canal*ACCESSIBLE. Photo by Antoni Abad, Barcelona, Spain, 2006.

The different Megafone interventions contemplated not only the collaborative creation of online content, but also periodic face-to-face meetings. The Megafone project not only gave its participants the means to represent or make their realities visible, but also allowed them to activate socializing mechanisms (López, 2014). Those face-to-face meetings became opportunities for the participants to go beyond the mere activity of publishing contents on the web by actually enabling social spaces for political agency and *voice* (López, 2007).

An example of how such enabling potential became realized may be seen in the canal*MOTOBOY project.[20] In 2007, the project gathered a group of motorcycle messengers (locally known as *motoboys*) in São Paulo, Brazil, who became involved in the creation of a collective web page, and also in rich and complex face-to-face interactions. Thanks to the social dynamics enabled by the periodic meetings of canal*MOTOBOY, the *motoboys* were able to make their *voices* broadly heard. They also strengthened their political standing as a group, organized several cultural events, and even published a book about their views and stories (Muniz, 2014).[21]
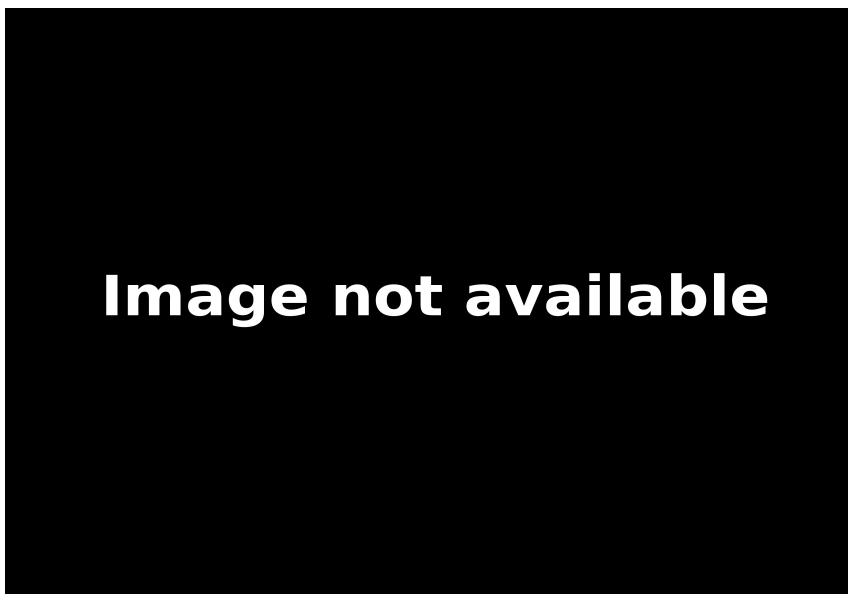
Figure 11. Participants of canal*MOTOBOY at the exhibition space in São Paulo. Photo by Antoni Abad, São Paulo, Brazil, 2007.

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20   canal*MOTOBOY: http://megafone.net/saopaulo/about (retrieved 24.03.2005)

21   The book "Coletivo Canal Motoboy" was edited by Eliezer Muniz dos Santos, a participant of canal*MOTOBOY, and published in Brazil in 2009 by an independent publishing house. The book featured contributions by other motoboys, some of them also participants of the Megafone project. Source: http://aeroplanoeditora.com.br/2012/01/coletivo-canalmotoboy/ (retrieved 24.03.2015)

The following table shows in chronological order our different interventions within the Megafone project (adapted from Parés, 2014).[22]

Intervention	Community[23]	Year
sitio*TAXI	Taxi drivers in Mexico City (Mexico)	2004
canal*GITANO (Lleida)	Young gypsies in Lleida (Spain)	2005
canal*GITANO (León)	Young gypsies in León (Spain)	2005
canal*INVISIBLE	Street prostitutes in Madrid (Spain)	2005
canal*ACCESSIBLE	Handicapped people in Barcelona (Spain)	2005-2006
canal*CENTRAL	Nicaraguan migrant workers in San José (Costa Rica)	2006-2007
canal*MOTOBOY	Motorcycle messengers in São Paulo (Brazil)	2007-ongoing
GENÈVE*accessible	Handicapped people in Geneva (Switzerland)	2008
canal*TEMPORAL	Displaced and demobilized[24] people in Manizales (Colombia)	2009-2010
canal*SAHARAUI	Young Sahrawi refugees near Tindouf (Algeria)	2009-2010
Punto de vista ciego	People with visual disabilities in Barcelona (Spain)	2010-2011

Table 1. Interventions of the Megafone project. By Eugenio Tisselli (2015), adapted from (Parés, 2014)

During the seven years in which I took part in the Megafone project, my contributions went beyond developing software. I attempted to enrich the project conceptually by publishing a series of articles[25] and also participated in its dissemination by presenting it at conferences. But perhaps my most significant contribution was the introduction of keywords or *tags* to classify and categorize the audiovisual contents published by the participants. In the first six Megafone interventions the contents (images, voice recordings, and videos) were only classified using categories defined and applied by experts[26] in a top-down fashion. However,

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22   My collaboration with the Megafone project ended in 2011. Since that year, two additional Megafone episoed were carried our by Antoni Abad: canal*PLURAL in New York, USA, and MONTRÈAL*in/accessible in Montreal, Canada (Parés, 2014).

23   While most Megafone initiatives remained open-ended in regard to the topics to be documented by the participants, canal*ACCESSIBLE, GENÈVE*accessible and Punto de Vista Ciego explicitly involved people with different disabilities who were asked to create a spatial and audiovisual critique of the inaccessible places they found in their cities.

24   In Colombia, the displacement and demobilization of people constitute different facets of the ongoing armed conflict. Displaced people are those who have been forced to leave their home towns or cities because of threats or violence, while those who have chosen to surrender their weapons and leave the guerrilla or paramilitary forces are known as *demobilized* people.

25   See, for example (Steels, Tisselli, 2008; Tisselli, 2010b)

26   In what became the first interaction between the Megafone project and researchers from other disciplines, sociologists and geographers from the University of León, Spain, produced a study in 2005 in which they derived a set of keywords or *descriptors* from the contents that had been published by participants. These descriptors were grouped into four categories: Activities, Spaces, Objects, and Beings, and were intended to be used as a dictionary with which to describe

since canal*MOTOBOY, the participants were asked to assign a tag to each of their audiovisual messages. Tags could either be chosen from a previously defined list on an ad-hoc mobile application[27] or typed, in case the desired tag did not appear on the list. Thus, instead of associating words from predetermined dictionaries *a posteriori* to online contents, a bottom-up, common vocabulary created by participants could emerge. At that time, I argued that using tags in such a way was fundamentally about sense-making and that tagging could be regarded both as a highly subjective and collaborative form of classification (Tisselli, 2010a). Consequently, the aggregated tags could also become part of the content: a collective vocabulary that could represent the shared interests of a specific community (Tisselli, 2010a).[28]

In retrospect, it is possible to say that certain interventions of the Megafone project successfully activated the participation of members of communities at risk of social exclusion by "amplifying their *voices* and offering them the opportunity to contribute to the reconfiguration of their social environment" (La Parra, 2014, p.54). Moreover, those interventions were coherent with Antoni Abad's critique of artists who were generally granted the privilege of speaking in the name of others. In his view, the work of artists who merely represented social issues was too superficial and possibly dishonest (Benítez, Argüello, 2014). Instead, he attempted to provide the actors of those issues with the means to amplify their *voices*, so they could speak for themselves through an unfiltered medium.

However, Megafone presented at least one problematic aspect that, in my view, prevented the project from attaining its full potential as a socially engaged artistic platform. This shortcoming stemmed from the fact that the software tools and social methodologies of the project were not released to the public in an open-

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all the audiovisual contents in the Megafone project. However, these predefined descriptors soon revealed their limitations, as they were too general to adequately describe the specificities of the diverse contexts in which the Megafone interventions were carried out (Somoza et al., 2005; Cuesta, Tisselli, 2007).

27   Shortly after canal*MOTOBOY was started, programmer Lluís Gómez joined me in the development of the Megafone software, with the specific task of programming a mobile application that would make it easier for participants to capture, compose, and publish audiovisual messages.

28   "Tagging can be defined as the enrichment of digital contents with semantically meaningful information in the form of freely chosen text labels, or tags. The freedom implied in this activity comes from the fact that tagging does not rely on a controlled vocabulary or a predefined taxonomic structure, but is instead an essentially individual act of classification. Tagging is fundamentally about sense-making, and can be viewed as user-defined filtering. Even though tagging can be considered mainly as an individual activity, the aggregation of tags produced by an online community evolves into a common vocabulary known as folksonomy. ... Tagging, in general, can be described as a highly subjective naming activity" (Tisselli, 2010a, pp. 141-142).

source fashion. One of the consequences of following a proprietary model, rather than an open-source one, was that only the team led by Antoni Abad could carry out new projects, and this excluded other groups who could potentially have benefited from the tools and methodologies we had developed. I believe that this model posed an important contradiction: on the one hand, the Megafone project sought to help communities to reveal, produce, and disseminate a sociocultural commons. But, on the other hand, its software codes and practical methodologies were withheld by the artist for the sake of copyright.[29] Consequently, the software platform and the methodology that I have developed for this research sought to overcome this limitation by adhering to the principles of the open-source movement.

0.3. *Cross-community* research.

Despite the existence of artistic interventions that aim at producing concrete social changes, my intention is to situate the methodology and practical aspects of this study within other fields as well. This intention corresponds to my active engagement with *cross-community* practice and research. In this dissertation, *cross-community research* will manifest through my collaboration with agroecologists, biologists, and agronomists, whose areas of expertise have been interwoven with mine (computer engineering and digital media art). Such collaboration is commonly known as *transdisciplinarity*: an integrative research strategy that breaks with the commonly held assumption that isolated disciplines may solve complex, multifaceted problems (Max-Neef, 2005). Transdisciplinarity goes *beyond* compartmentalized academic disciplines in order to encompass other areas of knowledge, such as the traditional knowledge held by small-scale farmers. As the prefix *trans* indicates, "transdisciplinarity concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines" (Nicolescu 2008, p.2). Alternatively, it has been argued that what is generated when different disciplines meet as equals at a conceptual round table is a shift in thinking that might be characterized as *post-disciplinary* (Harrison, Harrison, 2008). However, in order to transcend the

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29 This contradiction was aggravated by the fact that, as programmer of the Megafone software, I reused multiple fragments of code published on the World Wide Web by other programmers. Those fragments were published and shared under open-source licenses, with the explicit purpose of making them freely available to enrich the commons of software code. Therefore, the decision to not publish the Megafone software under a similar license might be seen, to some extent, as a privatization of a commons produced and openly exchanged by programmers.

disciplinary context, which inevitably refers to the type of systematic instruction and division of knowledge found in academia, I have chosen to qualify the research carried out in this dissertation as *cross-community research*. Although *cross-community research* adheres to the principles of trans- or post-disciplinarity, the term seeks to describe research that was enacted jointly and equally by members of different communities, including those whose systems of knowledge might not necessarily be considered as academic disciplines, such as small-scale farmers.

Cross-community research seeks to address complex problems by creating teams of people with experience and expertise in different academic and non-academic fields. Artists may find new roles in *cross-community research*. As media artist Jill Scott posited, artistic intervention is effective in a context where multiple areas of knowledge meet and work in conjunction with other fields of practice. Thus, artistic intervention enters into a situation outside the art world in an attempt to shift existing conditions and open up new dialogues (Scott, 2010).

0.4. A methodology for enabling the reciprocal exchange of *voice* and its related case studies in Tanzania and Mexico.

The practical case studies in small-scale farming communities included in this dissertation are a continuation of my experience in the Megafone project. However, they also represent attempts at conducting socially engaged artistic intervention as *cross-community research* initiatives, carried out according to the principles of a new methodology specifically designed to enable and encourage *reciprocal voice.*[30]

Although the case studies in Tanzania and Mexico will be fully described and analyzed in chapter 5, I will briefly present them in the following paragraphs so as to introduce them. The theoretical aspects of this study are closely related to the practical case studies; therefore, I suggest that the reader bear them in mind throughout chapters 1 to 4.

Figure 12. The common logo of the projects in Tanzania and Mexico. Designed by Eugenio Tisselli and Joana Moll.

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30 The practical case studies carried out in this dissertation adhered to ethical standards, as attested by the letters issued by supporting institutions, which are included in Appendix C.

Sauti ya wakulima.[31]

The participants in *Sauti ya wakulima* (Swahili: "The voice of the farmers") are a group of ten small-scale farmers from Bagamoyo, Tanzania,[32] who use smartphones to take pictures and record voice messages about diverse issues related to local agriculture. These audiovisual contents can also include tags, and may be enriched with geographical data. The contents are published on the project's website, thanks to a mobile app which was developed specifically for this case study (and used in subsequent ones). The farmers who participate in *Sauti ya wakulima* gather every week at the Chambezi Agricultural Station to discuss what they published on the website and to share the smartphones in rotation. These activities are overseen by a local coordinator, who also makes sure that every participant knows how to operate the smartphones.

Figure 13. Geographical location of Bagamoyo, Map of Tanzania by TUBS, map of Bagamoyo by Sémhur, both retrieved from Wikimedia Commons. Image composed by Eugenio Tisselli.

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31 *Sauti ya wakulima*: http://sautiyawakulima.net (retrieved 19.05.2015)

32 Bagamoyo is a district of the Pwani region, situated on the coast of the Indian Ocean. In 2012, its estimated population was 311,740, with a density of 36.8 inh./km². Source: http://www.citypopulation.de/php/tanzania-admin.php?adm2id=0601 (retrieved 31.07.2015)

Figure 14. A view of the Chambezi Agricultural Station. Photo by Eugenio Tisselli, Chambezi, Tanzania, 2011.

Los ojos de la milpa.[33]

Small-scale farmers from Santa María Tlahuitoltepec,[34] in the southern State of Oaxaca, Mexico, used smartphones and a web page to create a *digital manual* about novel agroforestry techniques introduced by local agronomists, aimed at minimizing land erosion and contributing to the reforestation of the region. During one year, *Los ojos de la milpa* (Spanish: "The eyes of the milpa"[35]) involved a group of ten participants who documented their practices, observations, and other events related to agriculture, thus gathering a significant body of audiovisual content in which their views and knowledge were represented.

Figure 16. A view of Santa María Tlahuitoltepec. Photo by Eugenio Tisselli, Santa María Tlahuitoltepec, Mexico, 2012.

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33 *Los ojos de la milpa*: http://ojosdelamilpa.net (retrieved 19.05.2015)

34 The town of Santa María Tlahuitoltepec is the head of the municipality which bears the same name. The population of the municipality was an estimated of 9,663 people in 2010, with a density of 128.38 inh./km². Source: http://www.sedesol.gob.mx/work/models/SEDESOL/Informes_pobreza/2014/Municipios/Oaxaca/Oaxaca_437.pdf (retrieved 4.08.2015)

35 For a definition of *milpa*, see Appendix E.

The methodology I have developed, which will be described in detail in chapter 5, may be considered as a bridge between these two case studies. *Sauti ya wakulima* was conducted according to my previous experience in the Megafone project and served as a practical basis for the formulation of a methodology that I have called *ERV (Enabling Reciprocal Voice) Methodology*. Subsequently, the full methodology was applied for the first time in *Los ojos de la milpa*, in order to test its principles, methods, and limitations in a concrete scenario. The following diagram illustrates the origin, development, and application of the ERV Methodology.

Informal practices of the Megafone project:

- Formation of a group with shared issues.

- Online and offline encounters.

- Usage of mobile phones and a Web interface.

- Tagging.

Sauti ya wakulima:

- Formalization of ERV Methodology.

- Emphasis on reciprocal aspects and potential for activating cross-community research.

Los ojos de la milpa:

- Full application of the ERV Methodology.

- Identification of strengths and weaknesses.

Diagram 1. The origin, formalization and application of the ERV Methodology. By Eugenio Tisselli, 2015.

0.5. Main research questions.

In this dissertation, a set of main research questions will be explored:

- Can the reciprocal exchange of *voice* be encouraged in small-scale farming communities by the transformation of information and communications technologies, artistic intervention, and *cross-community research*? And what is the relevance of this task?

- Is it possible to design and implement an open-ended sociotechnical methodology to effectively achieve that goal?

- What may be the role of information and communications technologies in such methodology?

- To what fields of knowledge and research may such methodology contribute?

Chapter 1: Voice and Reciprocity.

Introduction.

"Farmers have a lot of things to say, but no means where to say them," said Mrs. Renalda Msaki, a farmer who participated in *Sauti ya wakulima*, the case study I conducted in Tanzania. She expressed that farmers' *voices* had been neglected and demanded access to the means where they could be heard. But what are the things that farmers want to say? And why do they lack the means to *voice out*?

Attempting to provide a definition of *voice*[36] would exceed the scope of this dissertation; therefore, I will broadly understand *voice* as a human act that involves language and expression, as well as an element in the construction of a community. In this dissertation, such understanding will be related to a political perspective, in which *voice* will be regarded as a means for transcending the agency of individual bodies and achieving social recognition.

In this chapter, I will attempt to argue that strengthening a community's political capacity for making its *voice* heard is a relevant matter, since this capacity is currently in a state of crisis. Theoreticians such as Nick Couldry or Franco Berardi have situated the crisis of *voice* within the overlapping spheres of human relationships, culture, politics, and economy. According to these authors, the crux of this crisis seems to be the submission of *voice* to the logic of finance and its commodification by extreme forms of capitalism. Here, I will propose that the crisis of *voice* might be overcome if *voice* is regarded as an instrument of biopolitical agency. Such perspective may transform *voice* into an element that articulates the

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36 A philosophical approach to *voice*—that by no means would complete its definition—might argue that *voice* is the vehicle of speech. Defining *voice* as a carrier of speech implies bridging the Aristotelian distinction between *voice* (*phoné*) and reason (*logos*). Philosopher Stuart Elden discussed how Heidegger, in his extensive interpretation of Aristotle, defined *logos* not as the abstract human ability of pure thought, but as concrete speech. Heidegger claimed that the problems of philosophy had to deal with the factual nature of life, and so transformed his interpretation of logos as speech accordingly (Elden, 2005). Defining logos as speech raises the need for *phoné* as, unlike abstract reasoning, speech needs a physical carrier to release its semantic potentiality. Consequently, *voice* as a carrier of speech unifies *phoné* and *logos*, and represents a concrete manifestation of human action in the world. This unified view implies that *voice* is often (but not necessarily) sound. Consequently, *voice* can be considered as a physical and material process, even if some of its modern means of transmission are based on electromagnetic waves or electron flows. As a physical phenomenon, even when it is mediated by technical devices, *voice* "permeates and penetrates" the body of its listener (Ihde, 2007, p.45). It is a material connection that extends into space and time, between the body that emits *voice* and the body that listens to it.

production and management of a commons through the collaborative production and mutual exchange of knowledge. Under this perspective, I will suggest that *voice* can be understood as a form of reciprocal exchange, and that reciprocity is a form of social interaction that, if widely practiced, may pose an alternative to the hegemonic economic values that seem to prevail in contemporary social contexts. The basic features of reciprocal exchanges will be closely examined, with the purpose of arguing that *voice* may be exchanged reciprocally in order to solve its crisis and strengthen its value. Thus, the main proposal put forward in this chapter will be that the necessary conditions for strengthening the value of *voice* are very close to those which may strengthen reciprocity. The arguments presented in this chapter will become the theoretical basis for the ERV Methodology and its practical application, described in chapter 5.

1.1. *Voice.*

1.1.1. *Voice* as part of a *communal toolkit.*

The understanding of *voice* as an exchange between subjects requires an emphasis on its contents. These contents are part of a complex set of symbols that humans use to co-align their thoughts and perceptions and make sense of the world. This is what we call language, which may be understood as something that is constructed and practiced together with the course of human action.[37] Nevertheless, it is also something that is given to us since early childhood. The symbolic systems that we use to make sense of the world are already there when we are born, deeply entrenched in our culture. Thus, language can be understood as a *communal tool kit* that, when used, makes individuals into a reflection of their culture (Bruner, 1990).[38]

Making sense of the world through meaning-making and meaning-using processes connects individuals to their respective culture, and is a crucial part of an

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37 Wittgenstein proposed a notion of language as something that cannot be defined or seen as a whole (Reguera, 2002). By stating that "the limits of my language mean the limits of my world" (Wittgenstein, 2003, p.111), Wittgenstein placed language within the varied nature of human existence, subjecting its definition to this diverse, multivocal source.

38 "The tool kit of any culture can be described as a set of prosthetic devices by which human beings can exceed or even redefine the 'natural limits' of human functioning." (Bruner, 1990, p.21) Language is one of such prosthetic devices and, because language it is a cognitive space in which symbols are ordered in complex ways, it can be understood as a tool for overcoming human limitations, such as the biological limit on immediate memory (Bruner, 1990).

exchange, since "by virtue of participation, meaning is rendered public and shared" (Bruner, 1990, pp.12-13). Subordinating meaning to linguistic exchange implies that meanings are contextual: they are particular to the specific culture where they are exchanged (Bruner, 1990). Furthermore, humans have a predisposition to organize experience into a narrative form, and it is precisely the ability to create and tell stories that makes a culture viable, since narrative can be an instrument for resolving conflicts and negotiating communal meanings (Bruner, 1990). Storytelling thus contributes to the semantic stability of a culture, as it is composed of cultural meanings that have been previously agreed upon, and in turn generates new meanings and helps to build consensus around them.[39]

Narrative is strongly connected to *voice*, regarded as "... the process of giving an account of one's life and its conditions ... to give such an account means telling a story, providing a narrative" (Couldry, 2010, p.7). Thus, *voice* has an important role at the level of the self and its relation to a larger cultural context. However, it is difficult to think about a particular community exclusively as the product of endless processes of storytelling. How, then, can a community produce and exchange more or less fixed and stabilized meanings?

1.1.2. *Voice* in the symbolic construction of a community.

By offering a departure from previous notions of *community*, which either relied strongly on morphological and structural features, or were connected to the concept of identity, social anthropologist Anthony Cohen proposed that a community could be understood on the basis of symbolic exchange (Cohen, 1985). Cohen argued that the consciousness of a community was encapsulated in the perception of its boundaries, largely constituted by the symbolic interaction of its members (Cohen, 1985). The effectiveness of symbols in this process relies precisely on their vagueness: although they do not lack content, part of their meaning is *subjective* (Cohen, 1985). From this perspective, symbols may be regarded as media through

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39 The introduction of a new technological artifact in a specific social context, for example, is often accompanied by a story that justifies its necessity. The problem that the artifact aims to solve must be identified and narrated in a way that can be socially recognized as valid. Thus, by virtue of storytelling, new and potentially disruptive elements may be assimilated and related to an existing substrate of meanings, and thus allowed to enter culture in a rather smooth way. From this perspective, narrative may be understood as a homeostatic process that guarantees the coherence of a culture.

which people can speak a common language without subordinating themselves to rigid meanings. Thus, symbols contribute to reconcile individuality and commonality: while a symbol may be something (material or immaterial) upon whose existence and value different people may agree, it may be associated to a varied array of meanings (Cohen, 1985). Consequently, symbols may serve to align agreement, shared thought, and action, while their interpretation may vary by different degrees for people who interact through and with them.[40] In Cohen's argument, symbols become mental constructs that produce a community by supporting agreement and cohesion, while not necessarily asking for strict consensus. They form the semantic *commons* on which a community is based, while still allowing for the negotiation of meanings. A striking implication of Cohen's argument is that the strength and resilience of symbols relies, paradoxically, on their malleability. Even if shared meanings in a community may be eroded by its own cultural evolution or by external influences, symbols may persist while their contents change. Cohen showed that even when the structure of a community is dismantled (for example, because of colonialism), its cultural bases may be preserved symbolically.[41] (Cohen, 1985)

Individuals develop loyalty and attachment to their community precisely because they recognize that their own *voices* can be heard in it and that the contents of the community's vocal assemblage represent their own experiences and ideas (Cohen, 1985). *Voice* stands at the center of the symbolic exchange of a community, as it articulates the ongoing narrative processes that guarantee its coherence. In this dissertation, I will not refer to a *community* as an entity that has solidified into a

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40   Cohen's conception of symbolic interaction resonates with the theories of philosopher Gottlob Frege, who suggested that language was not linearly linked to thought. Frege posited that, while language was a necessary vehicle of human communication thanks to its capacity to record one's own thoughts, humans apply the same symbols to express things which are similar, but not exactly the same (Lotter, 2005). Because of this vagueness, the symbol is no longer attached to the thing, but to what a set of things has in common.

41   Cohen presented the introduction of socialism in Tanzania as an example of how an imported political form, which implied a radical reshaping of social structures, was assimilated and adapted locally. Under Tanzanian president Julius Nyerere, socialism became *African Socialism*, or *Ujamaa*. This africanization translated the customary corporatism of the tribal lineage system into the socialization of property, through Nyerere's argument that the modern nation-state was simply a large-scale tribal structure. Nyerere also ruled out opposing political parties by saying that political competition was an expression of class struggles, and that Tanzanian society was traditionally classless (Cohen, 1985). Thus, Nyerere sought to preserve and renew the abstract existence of the tribal structure as a mental construct, in order to contain the new meanings offered by European socialism. However, it may be argued that Nyerere's recasting of traditional political structures as socialism can be seen as a top-down imposition, rather than a process of symbolic construction carried out by the Tanzanian citizens themselves. Therefore, such political strategy might have brought, as a consequence, the silencing of the voices of those who opposed the ruling regime, and thus a potentially neutralizing effect on the process of bottom-up symbolic construction.

fixed status, but as a contingent one: as a network of symbolic and semantic interactions in which the strength and duration of its links are highly variable.[42] This notion of community will allow me to describe the groups of people who took part in the practical case studies as *communities*, albeit small and ephemeral ones.

1.2. The political relevance of *voice*.

1.2.1. The political scales of *voice*.

Voice is a means of symbolic and narrative exchange within a community and between communities, and therefore it is a process that happens at different scales. Couldry suggested the following, progressive ordering of social and political scales in which *voice* may be exchanged:

1. Interaction between individuals.

2. Large families, small groups or organizations, and small, not yet institutionalized communities.

3. Large communities that involve many groups.

4. A polity comprising many large communities and a formal representative structure.

5. A federation of political units in a large state.

6. Political organizations active on a global stage.

(Couldry, 2010)

Couldry's scale may be useful as a first approach at understanding the different levels at which *voice* may be exchanged politically. In this ordering, it becomes clear that *voice* as an *embodied* instrument of participation becomes compromised between levels 2 and 3. At this point, individuals start to increasingly require means for amplifying the embodied processes of speaking and listening, enacted at the first and second levels (Couldry, 2010). Therefore, when Mrs. Msaki said that Tanzanian farmers had no means where to make their *voices* heard in their

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42   This contingent and networked notion of community seeks to avoid the naive, merely rhetorical figure of community
     often used in capitalist discourse to legitimate social hierarchies (Joseph, 2002).

broader social context, she possibly referred to the concrete fact that farmers has insufficient access to local media outlets (radio stations, press, or TV channels) in Bagamoyo. Moreover, following Couldry's scale of *voice*, it may be assumed that Mrs. Msaki and her colleagues wished to communicate their voices, which were already being exchanged at the second level, to levels further up the scale. But why is it important to make *voices* heard beyond immediate contexts? What is the role of *voice* in the political organization of a community?

Couldry argued that, in a democratic political environment, individuals need to know that their *voices* matter (Couldry, 2010). Even at the highest levels, where the individual act of *voicing out* becomes increasingly less feasible, people need to recognize their inputs in what a group says or does and, if they do not, they should have the opportunities to correct that mismatch (Couldry, 2010). In order to secure the freedom to critically intervene in the different levels of social and political organization, Couldry distinguished between *voice as process* and *voice as value* (Couldry, 2010). *Voice as process* could be closely assimilated to Bruner's narrative acts of meaning: it is the act of giving an account of oneself and the world. It is a process which is "unimaginable except as part of an ongoing exchange of narratives with others", and thus, it is intertwined with other lives (Couldry, 2010, p.8). *Voice as process* is also a form of reflexive agency: voice can only be understood as a linkage between what individuals, groups, or communities say and what they might want or be able to do in the world.

1.2.2. *Voice*, agency, and mutual recognition.

The significance of *voice as process* is strongly determined by the context of action in which it occurs and the actions it triggers (Bruner, 1990). Following philosopher John Austin's formulation of the Speech Act Theory, saying and doing represent a functionally inseparable unit (Austin, 1962). Moreover, this form of agency is reflexive, as it asks responsibility from the speaker, who must take charge of her words and related actions. Arguably, it also demands a similar responsibility from the part of the listener, who must acknowledge having received the speaker's *voice* and, if needed, take action upon it. This interweaving of the speech and action

of subjects may be thought of as a form of *embodied intersubjectivity*, which not only entails mutual recognition, but also the acknowledgment of the place or context from which a body speaks, and in which a body listens.

Securing social recognition between speakers and listeners is one of the key tasks of political agency. Drawing from philosopher Axel Honneth's theory of social recognition, Couldry identified morality as the structure for sustaining mutual recognition (Couldry, 2010). Honneth proposed that the intersubjectivity of human life at all scales made moral injuries possible: in other words, it is possible to cause damage because of the way we treat each other. Contemplating the absence of such injuries may be unrealistic, as the diversity of subjects living together in a social context is so vast that their diverging interests may naturally give rise to conflict and mistreatment. Therefore, any notion of the *common good* must deal with such injuries in order to minimize them (Couldry, 2010). By linking the process of minimizing moral injury with democratic theory, the broad political task of securing mutual recognition might be achieved. Recognition, in political philosopher Nancy Fraser's interpretation, is the acknowledgment that a subject has a political *voice* (Couldry, 2010). And, precisely, the act of giving an account of oneself as part of the symbolic exchange in the context in which one acts may be a possible starting point for achieving recognition as a political subject (Couldry, 2010).

1.2.3. *Voice* as *value*.

Mutual recognition and political agency form the basis of what Couldry distinguished as *voice as value*:

"By voice as a value, I shall refer to the act of valuing, and choosing to value, those frameworks for organizing human life and resources that *themselves* value voice" (Couldry, 2010, p.2).

Regarding *voice* as a *value* means creating the proper conditions for *voice* to be exchanged as *process*. Such conditions are related to visibility: as Couldry argued, people need to be visible in order to be recognized as *having a voice* (Couldry, 2010).

But is visibility enough?

Besides visibility, the conditions for a generalized recognition of *voice* within a social environment may also entail a struggle for legitimacy. In this dissertation, I will analyze the processes by which small-scale farmers have been rendered invisible and their practices and knowledge have been deemed obsolete. Small-scale farmers carry the double burden of invisibility and illegitimacy, and therefore the task of creating social frameworks where their *voices* can be heard and valued, as attempted in this research, may acquire political significance.

Consolidating *voice as a value* in complex political environments might lead to the consideration that no form of social or economic organization can be regarded as being legitimate if it prioritizes other values over the value of *voice*.

1.2.4. *Biopolitical voice.*

The importance of *voice*—individual or collective—in the arena of politics may be adequately understood through philosopher Michel Foucault's notion of *biopolitics*.[43] Although *biopolitics* has been the subject of diverse interpretations, I will focus on the definition proposed by political philosophers Michael Hardt and Antonio Negri: that *biopolitics* is, primarily, the production of alternative subjectivities (Hardt, Negri, 2011). Here, *biopolitics* is understood as the basis of a political project that deals with the struggles for an autonomous production of subjectivity in the face of totalitarian regimes. The larger political subject of this struggle is the *multitude*,[44] which *produces* itself by composing its individual subjectivities in the form of a commons (Hardt, Negri, 2009).

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43   Foucault's original definition of *biopolitics* is derived from his notion of *biopower*: a set of diverse techniques exercised by the state to achieve the subjugation of bodies and control of populations (Foucault, 1990a). *Biopolitics* is the practical application of *biopower*, which may also be exercised by civilians as a form of resistance against the state.

44   The *multitude*, a notion originally proposed by philosopher Baruch Spinoza, opposes the uniform notion of *the people*, indicating a plurality that persists as such in the public scene, without converging into a unified order (Virno, 2004). The multitude denies legitimacy to the *voice* of the totalitarian state that issues its *voice* to a nameless, uniform *you* (the people): it reclaims diversity, and refuses to be reduced to a standardized form of social and political existence. What is at stake is a new form of relationality, as well as a new form of social and political agency that may emerge out of these multitudinous, collective, and multivocal relations (Murray, 2005). The multitude differs from Cohen's symbolically constructed community because of its greater degree of complexity and heterogeneity, and it also differs from Couldry's rather tidy stratification of political scales of *voice*. Rather, it represents the irreducible and unclassifiable nature of social groups and their struggles.

Hardt and Negri's interpretation of *biopolitics* distances itself from classic political philosophy by focusing on Foucault's emphasis on the concrete reality, diversity and relationality of *bodies*, instead of an abstract or transcendental understanding of *beings*.[45] To define *biopolitics*, Hardt and Negri assumed that bodies are the constitutive component of its tissue. Subsequently, they proposed that, despite the constant transformation of such tissue, bodies resist in order to exist. Finally, Hardt and Negri postulated that such embodied resistance produces subjectivity: not in an isolated or independent fashion, but within a complex dynamics together with the resistance of other bodies (Hardt, Negri, 2009). As these assumptions and postulates suggest, *biopolitics* may be understood as the means for the production of alternative subjectivities. As such, it is a form of embodied power that resists centralized, governing power and seeks its autonomy from it. But what is the role of *voice* in *biopolitics?* According to Hardt and Negri,

"... *biopolitics* is presented as a dense interweaving of acts of freedom ... Foucault grasps the creative nature of such acts: *la parole* intervenes upon and disrupts *la langue*[46] ... as a moment of linguistic innovation. The act marked by the innovative interruption of *la parole* beyond *la langue* is expressed as an intervention in the field of subjectivity ... through a ... renewed production of subjectivity" (Hardt, Negri, 2009, p.59).

Voice, seen from a *biopolitical* perspective, may go beyond the capacities identified so far: it may not only allow the negotiation of shared meanings, but also the innovation and production of alternative meanings. Moreover, it may not only be linked to everyday action, as suggested by Austin's Speech Act Theory, but also regarded as a source of resistance in the political scenario. Biopolitical *voice* is not only the expression of a set of linguistic symbols shared by a community: it is also the embodied vehicle for the creation of new symbols that can represent a common

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45   Indeed, Foucault insisted that power could not be understood as an intangible influence emanating from a centralized seat, but as myriads of micropowers that are exercised as a system of capillarities, that is, of interconnected channels that flow through the bodies and norms which constitute societies (Foucault, 1990a).

46   The terms *langue* and *parole* were introduced by linguist Ferdinand de Saussure to differentiate between the system of language that precedes and makes speech possible (*langue*), and the way language is actually uttered (*parole*) (Saussure, 2000).

struggle for alternative forms of existence. Behind such innovative possibilities of *voice,* understood as a constituent of *biopolitics*, is the consistent ability of language to constantly renew the relations between multiple speakers, sometimes in unexpected ways. Bruner and Cohen spoke about the negotiation and renewal of meanings as the basis for human relations and the construction of a community. In *biopolitics*, the role of *voice* becomes augmented in order to create new ways of life that differ from those dictated by the governing regime.

1.2.5. *Voice* and the *commons*.

The exercise of *biopolitics* is a condition that enables the production and maintenance of a *commons*. Political economist Elinor Ostrom defined *commons* as a general term for shared resources in which each stakeholder has an equal interest (Ostrom, 1990). Most of these shared resources, particularly those found in the natural environment, can be defined as *common pool resources*, where one person's use may subtract from the use of others, raising the need for organization and regulation.[47] However, some forms of human-made commons, such as language, are not subject to depletion through usage (Hess, Ostrom, 2006). The production, usage, organization, regulation, and access to the commons are endeavors that must be collaboratively carried out by everybody involved, from which it follows that the notion of commons can pose an alternative to the dualism of public vs. private ownership of resources in the political field. Similarly, thanks to its collaborative nature, this notion also stands as an alternative to competition.

Studies by political scientist Amy Poteete et al. on collective action and commons have found that those who manage and organize a commons require complete information about its nature and structure (Poteete, Janssen, Ostrom, 2012). Therefore, *voice* as a carrier of speech and thus also of knowledge may be crucial in the construction of informational resources relevant to a commons.

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47 Possible conflicts when managing a commons may be illustrated by ecologist Garrett Hardin's well known model, the "tragedy of the commons". Hardin's model assumed that individuals who participate in a commons may deplete it, because their actions are guided by self-interest rather than the group's long-term shared interest (Hardin, 1968). However, critics of Hardin's model argue that it naturalized egoism, greed, and competition (McCay, Jentoft, 1998), and that communities who participate in the production and maintenance of a *commons* tend to see the other not as an intruder, but as a *co-venturer* of a socially integrated *we* (Etizoni, 1988, p.9). As political scientist Robert Axelrod argued, even self-interested individuals will often find ways to cooperate (Axelrod, 1984).

Philosopher François Jullien proposed a notion of *commons* close to the field of *voice*, by understanding it as the outcome of a dialog between different communities in search of what they have in common (Jullien, 2010b). Jullien's view on the commons is based on the exchange of narratives: a deliberative practice directed towards the negotiation of differing meanings. Thus, finding what is common in culturally distant environments could be seen as a shared process of making sense of the world, beyond the concepts of universality and uniformity. This interrelation between *voice* and *commons* may refine the notion of *voice* as a central instrument of political participation within a community. By linking *voice* to the notion of a culturally diverse multitude, rather than limiting it to the boundaries of a well-delimited community, and by considering it not only as an instrument for the production of a *commons*, but also as a *commons* itself produced though biopolitical agency, *voice* may be regarded as a valuable and complex form of exchange.

Biopolitics may articulate Ostrom's concrete understanding of the *commons* and its need for organization and regulation, and Jullien's deliberative negotiation of the *commons*. The *commons*, as Hardt and Negri argued, is entirely internal with respect to the processes of biopolitical production (Hardt, Negri, 2009). In other words, the contemporary production of alternative subjectivities may entail a confrontation against the capitalist powers that appropriate the *commons* in order to produce privatized accumulation and wealth. Democracy is imaginable and possible only to the extent that we all share and participate in the production and maintenance of the *commons* (Hardt, Negri, 2009). Therefore Hardt and Negri proposed a three-part program for a *biopolitcal rationality*:

1. *Bipolitics* should put rationality to the service of life, as opposed to economic accumulation.

2. *Bipolitics* should put technology to the service of ecological[48] needs.

3. *Biopolitics* should put the accumulation of wealth to the service of the *commons*.

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48 Ecology is understood here not just as the natural environment, but also as the development of social relationships between humans and non-humans. For a detailed account of such an understanding of ecology, refer to Morton, 2007, and Latour, 2009.

(Hardt, Negri, 2011)

The notion of *knowledge as a commons* may augment the understanding of the importance of the value of *voice*. Language is the primary vehicle for the interpersonal (one-to-one or one-to-many) transmission of information, a process that plays a central role in shaping human knowledge (Kalish et al., 2007). It may be argued that, in order to secure this process, language should be regarded and treated as a *commons* as well, since ideas, images, and stories, all of them constitutive parts of knowledge, are never produced by a *solitary genius*, but by a vast network of cooperating producers (Hardt, Negri, 2011). Therefore, if privatized, language could significantly lose its powers of communication, expression, and creativity (Hardt, Negri, 2011).

Voice is an element without which participation in social and political scenarios would be unthinkable. *Voice* may reach *horizontally* beyond the immediate community and into the multitude, and *vertically* towards the institutions in which political power is exercised. It is a source of action and a requirement to achieve mutual recognition. It is not only an instrument that allows people to recognize and produce a *commons*: it is by itself a *commons*. But how do contemporary forms of capitalism affect the qualities and capacities of *voice*?

1.3. The crisis of *voice*.

Implicitly or explicitly, a number of contemporary authors coming from different fields speak about a *crisis of voice*, which may be summed up as the following paradox. Communities around the world have an unprecedented access to outlets for making their *voices* heard. Thanks to the advent of digital networking technologies—for example, the rapid adoption of the Internet and mobile phones by the population of even the poorest countries—there seems to be no shortage of opportunities for a significant proportion of the world's population to be heard. Yet, *voice* as an instrument of political participation has never been so devalued. Using Couldry's terminology, *voice as a process* is unprecedentedly accessible and widespread, yet *voice as value* has strongly declined. Stated in biopolitical terms, the

capacity of *voice* as an instrument for creating alternative subjectivities is denied by the crisis, and this denial is masked by an excess of communications platforms. But how can this paradox be untangled? I suggest that such entanglement may be thought of as a complex social phenomenon, composed by the interaction of many different elements, including technological platforms and political and economic models.

While the paradoxical relation between *voice* and information and communications technologies will be explored in chapter 2, here I will focus on the correlation of the crisis of *voice* with neoliberal capitalism. Neoliberal capitalism has become so pervasive that it seems to deny the people's capacity for imagining worlds outside the current economic models. The preemptive attitude towards social movements, applied by political leaders throughout the world, may be read as an effort to convince every citizen that the financialized, semifeudal capitalism that is currently in effect is the only viable economic system for maintaining prosperity and growth (Graeber, 2013). However, in a world where perpetual economic growth, an essential values of capitalism, may no longer be socially or environmentally sustainable,[49] the invention of alternative economic narratives may become a requirement for human survival.

1.3.1. The hegemony of neoliberal capitalism.

While it is beyond the scope of this dissertation to provide an in-depth analysis of the current form of capitalism and its wide consequences, I will examine some of its crucial features in order to examine how it undermines *voice*. As philosopher Jean Baudrillard posited, the current form of all-encompassing economic globalization can be understood not as domination but as an hegemony (Baudrillard, 2010). Domination can be characterized as a master/slave relation, in which opposing forces fight each other in a history of oppression and liberation. By

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49 In 1972, a group of authors commissioned by the Club of Rome wrote a seminal book called *The Limits to Growth*. In the book, they presented the results of a computer simulation of exponential economic and population growth with finite resource supplies. Two out of three possible scenarios modeled by the computer simulation predicted that the global system would be subjected to overshoot and collapse, and strongly suggested that the then-current pace of economic growth was unsustainable (Meadows et al., 1972). In 2011, an academic study of *The Limits to Growth* concluded that the warnings of the 1972 study had become increasingly worrisome, and that reality seemed to be following the curves that the computer simulation had generated (Bardi, 2011).

contrast, hegemony begins with the disappearance of this dual domination for the sake of an integral reality, where nothing is thinkable outside power (Baudrillard, 2010). By internalizing global order through consensus, be it voluntary or involuntary, traditional servitude is thus replaced by a kind of abduction. In this light, hostages of economic globalization are unable to view the kidnappers, because the dispersive, global network of capitalist hegemony blurs the formerly stable roles of labor, production, and consumption (Baudrillard, 2010).

Economic deregulation and privatization are considered to be the flagships of the current capitalist hegemony, also known as *neoliberalism*. The application of these measures and their negative consequences on societies across the planet have been documented in detail by political analyst Naomi Klein. The implementation of these highly unpopular measures by national governments, argued Klein, can only be carried out after the population is driven into a state of shock (Klein, 2007). Philosopher Adam Smith's *laissez-faire* economics[50] based on self-interest have been considered as the predecessor of free markets in neoliberalism, which, according to Klein, attempt to naturalize the economy by delivering societies to a state of "pure capitalism, cleansed of all interruptions—government regulations, trade barriers, and entrenched interests" (Klein, 2007, p.60).

A free-market economy is unprecedented, since societies have historically developed economies not as means to safeguard individual interests and material possessions, but to guarantee their social standing and their social rights and conquests (Polanyi, 1996). By overriding all other forms of social organization, a free-market economy such as the one envisioned by neoliberalism threatens to tear apart human relations by privileging self-centered interests (Polanyi, 1996).

1.3.1.1. Neoliberal competition against the *commons*.

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50 Although the notion of an *invisible hand* that regulates economic markets appears in Adam Smith's classic work, *The Wealth of Nations*, published in 1776 (Smith, 2001), Smith's theories are far from suggesting that markets should be left unfettered by governments or regulations. Smith did imply that the selfish interests of investors may have unexpected beneficial consequences. However, he also argued that government regulation was important in order to keep merchants from gaining control of economic matters, since their interests were often very different from those of the public (Patel, 2010). Nevertheless, free-market ideologists have interpreted Smith's theories to justify the implementation of self-regulating markets in order to further the enterprises, based on selfish interests.

One of the core values of capitalism is competition. To be a successful capitalist, one must compete against others in an endless race to accumulate goods and wealth. However, an extreme drive to compete may turn cooperation into a senseless pursuit: in fact, it is often seen by capitalists as a parasitic activity. Competition directly affects the shared resource of a *commons*, whose sustainable usage needs organized cooperation. Highly competitive capitalist enterprises with the mandate of perpetually increasing their benefits tend to deplete or commodify common resources, including knowledge and *voice*, sooner or later (Polanyi, 1996). However, in spite of its ideological tendencies towards the appropriation of common wealth, capitalism cannot do without the *commons*. The capitalist answer to the usage and preservation of the *commons* is its privatization and subsequent transformation into private wealth.[51] Of particular relevance to this dissertation is the capitalist appropriation of knowledge. The privatization and commodification of a knowledge commons, often executed through intellectual property rights, may effectively break the course of its collaborative production. Moreover, given the strong relation between a *knowledge commons* and *voice*, the biopolitical resistance against the capitalist appropriation of knowledge may also become a struggle against the appropriation of *voice*. But how does the neoliberal hegemony affect *voice*?

1.3.1.2. The abstraction and commodification of *voice*.

Neoliberal hegemony can be seen as the culmination of a growing process of abstraction. According to philosopher Franco Berardi, capitalism has managed to overcome the dualism between body and soul, by implicating all the human qualities associated with the soul—instinct, intelligence, creativity, passion—into what he called *semiotic labor* (Berardi, 2009). While industrial capitalism extracted value from human muscular force and physical skills in factories, he suggested that the new form of *semiotic capitalism*, fed by digital technologies and cyberculture, exploits mind, language, and emotions. Berardi linked this movement of abstraction to the shift between past forms of domination, when power was exercised by the bourgeoisie, a strongly territorizalized class, to the de-territorialized financial class

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51 This tendency can be traced back to the theories of Adam Smith, who subsumed the common good to private interests, disregarding all other forms of human exchange: "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest" (Smith, 2001, p.17).

that commands the neoliberal regime (Berardi, 2012). In a world ruled by financial capitalism, accumulation no longer passes through the production of useful goods, but directly extracts value from the pure circulation of money and from the virtualization of life and intelligence (Berardi, 2012). In his work *The Uprising*, Berardi posited that the abstraction of labor and the production of value was strongly connected to the abstraction of language. The erratic, capricious behavior of stock markets is not related to changes in the physical world and does not respond to the monetary equivalence of produced goods. Instead, the evolution of financial markets is the effect of *performative* utterances: acts of speech that produce immediate effects in the very instant of their enunciation. But, according to Berardi, economy transformed into a purely linguistic machinery modifies, in turn, language itself.[52] Language, Berardi claimed, has been turned into a wired, automated system: as is the case with money, the production of meaning and value is virtualized by submitting it to a process where "signs produce signs without passing through the flesh" (Berardi, 2012, p.17). Seen in this perspective, the roots of the crisis of voice may be found in a radical loss of linguistic referentiality, where what is said no longer represents the world or expresses human values, but is simply regarded as a commodity. The commodification of voice operates to increase the wealth of those who exploit semiotic production. As exemplified by engineer Frédéric Kaplan, Google has managed to create wealth from its search engine services by creating an algorithm that associates a monetary value to words used in on-line advertising (Kaplan, 2011). Facebook, another example of the transformation of *voice* and social interaction into merchandise, is constantly trying out new strategies to monetize what its users express. Facebook has been known to experiment recklessly with its users, eventually finding ways to extract wealth from their on-line social activity. Even when offered as a free service to users, most social web platforms are proprietary, and thus a short step away from monetizing social activity. As suggested by Couldry, by encouraging *voice* as a process through the proliferation of multiple proprietary platforms, capitalism strengthens its own economic power and its hold over *voice* (Couldry, 2010).

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52 "Neoliberal ideology pretends to be a liberating force that emancipates capital from the state regulation, but in fact submits production and social life to the most ferocious regulation, the mathematization of language" (Berardi, 2012, p.31).

However, the commodification of *voice* is not only aimed at monetizing its value, but may also become an instrument for neutralizing its contents. Berardi argued that *truth* cannot be found in financial capitalism: only an exchange of signs and a deterritorialization of meaning. Such erosion of meanings was closely examined by philosopher Harry Frankfurt, whose work studied the contemporary preponderance of *bullshit*.[53] Frankfurt examined the propensity of certain cultures to speak *bullshit* by relating it, among other things, to the democratic mandate that states that citizens are responsible for expressing their opinions about a wide range of matters (Frankfurt, 2005). Under such mandate, everybody is compelled to speak, regardless of the significance of what is said. Consequently, Frankfurt proposed that the opposite to the truth is not a lie, for a liar is still compromised with the truth and seeks to twist and subvert it. The opposite of the truth is *bullshit*: a complete indifference towards the truth value of any utterance.

Although Berardi linked the mathematization of language and the erosion of truth and meaning to financial capitalism, these effects are not exclusive to the contemporary economic regime.[54] In fact, sociologist Pierre Bourdieu has claimed that political consensus necessarily implied the standardization of language, since the growing scale and complexity of politics tends to restrict the generative capacities of symbols into meanings (Bourdieu, 2008).[55] However, the unprecedented effects of neoliberal hegemony on language entail an active complicity from the speakers, who may incorporate linguistic automatisms and take them into the most intimate spheres of life (Bourdieu, 2008). Resonating with Baudrillard's notion of hegemony, such an active complicity may be regarded as a process of internalization of hegemonic values, in which alternative meanings and narratives become unthinkable (Bourdieu, 2008). But is the abstraction *voice* and its correlative internalization of

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53 According to Frankfurt, *bullshit* may be understood as a mode of speech which is neither true nor false, but rather indifferent to any commitment to the truth. Falseness, he argued, still holds a strong relation to truthness, since it seeks to hide or distort it. In contrast, *bullshit* is completely unpreoccupied with truth (Frankfurt, 2005).

54 The writings of literary scholar Victor Klemperer, for example, document the usage of propagandistic language and euphemisms under the Nazi regime in Germany (Klemperer, 2006).

55 Writer Shiva Naipaul eloquently described how the socialist regime of the 1970s in Tanzania imposed its own linguistic mechanisms of power over the population: "In Tanzania, where performance consistently negates intention, where every commodity … is in short supply, the socialist revolution is built with words. 'We are at war,' the Minister for National Education declares. But at war with whom? With what? With capitalist exploitation, of course. With imperialism. With neo-imperialism. With fascism.… A Party official looks at the beautiful volcanic peak of Mount Meru—and what does he do? He renames it Socialist Peak. That is war.... In Tanzania, words are not used to depict existing reality: they are used to confound it; to replace it" (Naipaul, 1980, p.284).

hegemonic values a global process? Is it true that there can be no alternative *voices* that speak against neoliberalism? And if there can be, could they effectively open a fissure in the structure of the hegemonic regime?

Hardt and Negri proposed the term *altermodernity* to describe social movements whose biopolitical resistance proposed alternatives to hegemony (Hardt, Negri, 2010). Those movements are mostly comprised of (but not limited to) indigenous people who seek to strengthen their culture in face of the threats presented by the global economic and political regime. Among those movements, the *voices* of small-scale farmers, who have been largely excluded by the logic of neoliberalism, may be heard. But what political alternatives do their *voices* carry?

The words of Mrs. Msaki cited at the beginning of this chapter expressed a demand: that the farmers' *voices* should be heard. But did she sense that their *voices* were in a *crisis* such as the one described here? As she claimed, Tanzanian farmers had no media outlets for making their *voices* broadly heard. Her words suggested that, in her environment, *voice as a process* lacked even the most basic dissemination channels. A media-poor environment such as Bagamoyo and its rural area certainly did not allow for the widespread exchange of *voice*. However, her words also suggest that *voice* was valued in her social context. In turn, I suggest that there might be a correlation between a lack of media for *voicing out*, and a stronger social appreciation of *voice*. Such a correlation might explain the initial enthusiasm with which the farmers who participated in *Sauti ya wakulima* took up the project, and saw it as an opportunity for *voicing out*.

The contemporary *crisis of voice* points to the possibility that *voice* has been devalued thanks to an excess of commodified, emptied speech propitiated by the very technologies that were presumably designed to service the need for *voicing out*. But does this situation hold in the case of Mrs. Msaki's country, Tanzania? A brief examination of the Tanzanian economy, and therefore of the extent to which the presence of neoliberal policies may have affected *voice,* might shed light on this question. Tanzania quickly evolved politically and economically after its independence in 1961, and capital formation increased steadily from 1963 to 1967

(Bigsten, Danielsson, 1999). However, a period of economic instability followed, and a major crisis in 1979 increased the fiscal deficit (Bigsten, Danielsson, 1999). The strong decline of the Tanzanian economy was stopped with the 1986 reform, which included a standby agreement with the International Monetary Fund and a structural adjustment program with the World Bank (Bigsten, Danielsson, 1999). This period opened up a liberalization of the economy, and this trajectory has continued. A report from 2012 highlighted Tanzania as a model of sound economic performance, with a growth rate of over six percent in 2011 and 2012, and a decline of the fiscal deficit to five percent in that same period (World Bank, 2012a). However, a well-known feature of neoliberal economies is that macroeconomic variables are not necessarily reflected in the economy of daily life or the needs and well-being of citizens. As economist Raj Patel argued, what characterizes modern market economies is that they are not ruled by needs but by profits (Patel, 2010). In fact, the report cited above admitted that, despite recent economic successes, growth had failed to impact those who make up 80 percent of the country's mostly rural population (World Bank, 2012a).

Consequently, it may be argued that farmers like Mrs. Msaki have been largely left out of the process of economic liberalization and growth. The supposed development of their country has not been translated into the infrastructure (including communications) that they require to improve their livelihoods. Therefore, I suggest that the internalization of neoliberal values that has fueled a crisis of *voice* in different parts of the world may not fully apply in the case of rural Tanzania. Following my observations in Tanzania, I consider that neoliberalism currently coexists with a large informal economy, since the dominant form of exchange between farmers in Bagamoyo is much more reliant on social networking than on economic transactions. These observations are confirmed by the studies of economist Serge Latouche, who proposed that the informal economy found in most African countries posed an alternative to official economic regimes (Latouche, 2007). However, Latouche did not see a dualistic scenario in which the informal economy stood against neoliberalism. Rather, he affirmed that both economic forms coexisted and often influenced each other in complex ways. Nevertheless, despite such coexistence, during the course of the case study I heard the farmers from Bagamoyo

repeatedly express that they wanted to become "successful entrepreneurs." Entrepreneurship, one of the core values of neoliberal ideology, can be understood as the individual drive to own and manage a business, and the innovation that results from pursuing economic gain.[56]

Following these considerations I suggest that, while citizens living in advanced neoliberal economies might be experiencing a devaluing of *voice* caused both by an excess of *voice as a process* and the *voice*-eroding effects of the internalization of economic values, the *crisis of voice* in Tanzania might not be felt so strongly yet, and may rather be perceived as a lack of outlets for making *voices* heard.[57] However, because of a growing pressure to adopt neoliberal measures, the survival of informal economies based on social networks is highly uncertain and could change drastically in the following years. This pressure, in turn, might signal the introduction of ideological elements which have triggered the crisis of *voice* elsewhere. Thus, I propose that the need to strengthen *voice* in face of its crisis, whether looming or fully installed in a specific social environment, calls for an active investigation of methodologies that may reinforce its value. This, in fact, is the main aim of this dissertation and its methodological contribution, the ERV Methodology. But how can the negative effects that the political and economic hegemony exert on *voice* be resisted?

1.4. Resisting the crisis of *voice*.

The effective limitation of the political potencies of *voice* is often tied to hegemonic political regimes, causing language to become disseminated and controlled in a top-down fashion by ruling powers. This contradicts the notion of *voice* as means for a bottom-up production and negotiation of symbols and meanings, as proposed in this chapter. However, Bourdieu (2008) posited a more complex arrangement that integrates both modes of linguistic generation, by

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56   According to philosopher Cornelius Castoriadis, the entrepreneur is the only anthropological type created by capitalism. He argued that, in fact, capitalism needed the figure of the entrepreneur to become established (Castoriadis, 1998). In neoliberalism, this figure is still at the center and considered as an individual agent of economic competition and growth (Riechmann, 2014).

57   As I will argue in chapter 3, in Mexico, where I carried out the second case study of this dissertation, neoliberalism is much more advanced and has affected small-scale farmers more directly than in Tanzania.

considering *voice* as the conjunction of *habitus* and *market*. He defined *habitus* as the dispositions and expectations acquired through the activities and experiences of a social group, and *market* as the linguistic elements that are valued or imposed in certain contexts (Bourdieu, 2008). From this perspective, language evolves under the interacting influences of bottom-up usage and top-down control. This creates a tension that allows for a biopolitical negotiation of language, a negotiation through which alternative *voices* can be heard. Thus, linguistic interaction can be precisely where fissures in the structure of hegemonic power may start to form.

Yet the uniformity and automatization that are substantial to hegemonic regimes are not insurmountable obstacles for *voice*, as they immediately enable discrepancy (Tarde, 2013). Therefore, I posit that the resilience of *voice* might be revealed by its capacity to question and debilitate hegemonic values. Contemporary forms of political antagonism, exemplified by the social movements that emerged after the global financial crisis of 2007-2008 in different parts of the world, point to the fact that the multitude's capacity for biopolitical negotiation has not been entirely subjected by neoliberal values.[58] If anything, an unfortunate indicator of the power held by the *voices* of the multitude can be seen in the increasingly oppressive laws and enforcement measures exercised by governments. These tensions suggest that the value of *voice* needs to be strengthened so that *voices* proposing counter-hegemonic values may be heard.

Couldry argued that the vagueness and malleability of *voice*, akin to Cohen's semiotic vagueness of symbols, may be considered as a strength that renders it flexible and thus adapted to survive major transformations (Couldry, 2010). The semantic ambiguity of language and *voice* is also valued by Berardi, who posited that language might escape the effects of mathematization and abstraction by recovering its capacity for sensuous, non-rational communication (Berardi, 2011). Here, both arguments converge in the reinforcement of the qualitative potencies of language, rather than its quantitative aspects. It would follow then, that an abundance of

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58   The Arab Spring and the European social movements after the 2007-08 financial crisis are studied in detail in the issue "The Season of Revolution" of the *Interface Journal.* In the issue's editorial, movements in both Northern Africa and Europe are identified as being against neoliberal measures, such as cuts in social spending or the debilitation of democratic governments (Shihade, Flesher, Cox, 2011).

channels for *voicing out*, by itself, may not be enough to face the crisis of *voice*. As discussed, *multiplying voice* often serves the purpose of further banalizing and devaluing it, while strengthening the powers that seek to debilitate it. However, *voices* need to be widely heard. How can the paradox posed by the debilitation of *voice* through its multiplication be faced?

Couldry underlined that the bodily quality of *voice* may be a crucial feature for developing counter-hegemonic rationalities (Couldry, 2010). Therefore, the creation and accessibility of physical spaces where bodies may conjoin and engage in an embodied exchange of *voice* may be regarded as a possible strategy for solving the paradox. Couldry suggested that the crisis of *voice* could be resolved by looking beyond voice and language itself: "People's *voices* only count if their bodies matter" (Couldry, 2010, p.130). Thus, the conditions for an embodied appreciation of *voice as value* need to be created. According to Couldry, such conditions entail reversing the exclusions of *voice* that neoliberalism has endorsed and including new voices (Couldry, 2010).[59] As I will discuss in chapter 5, the ERV Methodology aims to create the conditions for the exchange and dissemination of *unheard voices*.

1.4.1 Agency and economic values.

The crisis of *voice* goes beyond the mathematization and abstraction of language and the devaluing of *voice*. I posit that, if *voice* is considered as a form of agency, and if agency is submitted to a heavily restricted capacity, then *voice* may become disconnected from what individuals and social groups want to do within the sphere of politics. This restriction of agency and *voice* may not be seen as a form of domination or oppression, but rather as the internalization of hegemonic values. When such a process takes hold of *voice* and its capacity for political agency, values associated with economic rationality, such as the notion of Rational Choice Theory,[60] tend to become widely assimilated and bring economic thinking to the most intimate spheres of human life. Rational Choice Theory is considered to be a psychological

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59   In this dissertation, I consider farmers' *voices* as new because, as I will argue in chapter 3, they have been largely neglected not only by neoliberalism, but also by most political orders that have ruled since the onset of Modernity.

60 Rational Choice Theory was proposed and first applied by economists associated with the Chicago School of Economics, such as Gary Becker, Milton Friedman, or Daniel Kahneman (Blume, Easley, 2008).

model which assumes that decision-making is always instrumental, that is, that whoever makes a decision invariably seeks an efficient pursuit of ends by available means, rather than considering the sensibility of those ends (Blume, Easley, 2008). Economists have favored this model and turned it into the cornerstone of modern economic rationality, as it proposes that choice is regularly guided by rational models such as utility theory, optimization rules, or minimization of chagrin (Bruner, 1990). The assumption that every human decision is based on the maximization of benefits and the minimization of costs has its roots in the notion of *homo economicus*, formulated in the nineteenth century by economist John Stuart Mill.[61] This notion served as a basis for early proponents of Rational Choice Theory, such as economist Gary Becker, who argued that the economic focus provided a useful framework for understanding all human behaviors (Becker, 1976). Becker's generalization of *homo economicus* sits on three assumptions: that all humans seek optimization and maximization; that every action is performed in some kind of market; and that the preferences of *homo economicus* are constant throughout different societies and circumstances (Becker, 1976). In politics, this model may imply that a perfect democracy should function as a perfect market, leading all citizens to compete for maximization in all areas of life. Couldry argued that neoliberalism has turned such economic notions and models into mandates that guide everyday behavior and must be internalized by all citizens (Couldry, 2010).

1.4.2. Resisting the commodification of the *commons*.

As a consequence of the hegemony of economic rationality, the capacity for political agency, especially a collective one, is reduced by an internalization of competition and individual benefit, ruling out cooperation and solidarity. But how does economic rationality affect the *commons*? Rational economic theories recognize the *commons*, but only as an *externality*. Modern economics defines *externalities* as costs which are not reflected in the price of a good, such as the ecological damage caused by its forms of production (Patel, 2010). It follows that the different types of *commons* that exist are regarded in economics exclusively as expendable resources to

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61 The *homo economicus* is an abstract model of the individual, and was considered by Mill to be the only method that could lead to the truth in any area of social sciences (Mill, 1997).

be exploited. As discussed, Hardt and Negri proposed that the work force of biopolitics produces the common good, which is essentially external to capitalist production and internal to the multitude. But fierce economic competition exploits the common good, thus appropriating biopolitical production as well. The capitalist exploitation of the *commons* may include the commodification of language, knowledge, and *voice*, which arguably conform the most important form of open *commons* generated throughout human history (Benkler, 2006). The dynamics of human knowledge would be unthinkable if knowledge itself was not considered and treated as an open *commons* from which everybody can draw and to which everybody can contribute. However, patents and copyright licenses may be seen as capitalist instruments for commodifying knowledge and have generated a considerable tension between the privatization of the knowledge *commons* and the possibilities of openly accessing it (Lessig, 2004). Thus, a form of biopolitical agency could consist in the resistance against the dictate of competition and the appropriation of the *knowledge commons* by predatory capitalism. Moreover, such resistance might be rightfully regarded as a *commons*, since biopolitics is always potentially oriented beyond the self (Couldry, 2010). Once the perspective of the *commons* is adopted, the processes of valorization, accumulation and distribution of knowledge necessarily become social, rather than individual. Under such perspective, collaboration and cooperation may replace competition.

As Hardt and Negri claimed, the bipolitical production of the common good is already becoming the predominant mode of production in the contemporary economy, replacing the role of industrial production. Consequently, it is possible to say that capitalism no longer expropriates individual wealth, but is the result of a social potency. The expropriation and commodification of a knowledge *commons*— for example, traditional medicine—through patents and intellectual property rights, may illustrate this point.[62] Through the internalization of neoliberal values, *voice* as

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62 It has been argued that the commodification of traditional knowledge has been practiced since colonialism, and that protecting it with intellectual property rights might benefit indigenous peoples since it may provide them with economic benefits derived from its usage (Brush, 1993). However, the commodification and subjection of traditional knowledge to intellectual property rights, which were first developed in Europe to protect individual and industrial inventions, raises ethical issues, since they essentially contradict the notion of knowledge as a *commons*, shared by many traditional societies (Posey, Dutfield, 1996). Furthermore, diverse components of traditional knowledge, such as traditional medicine, have been expropriated under intellectual property rights by researchers and commercial enterprises, without any compensation to the knowledge's creators or holders (Correa, 2002).

an instrument of political participation has been devalued in favor of self-interest and economic rationality. But, precisely because of this process in which values become embodied process, a bipolitical strategy of common, collaborative forms of agency may be proposed as an effective way to resist the crisis of *voice*. However, the exercise of biopolitics requires a certain degree of autonomy, as its production exists on a different level from the public and the private (Hardt, Negri, 2011). Therefore, a complex set of transformations may need to be activated in order to generate the conditions for an autonomous exercise of biopolitics. One of these transformations entails the weakening of competition as the predominant value in society. In this dissertation, I propose that competitive social relations can be replaced by reciprocity. But can reciprocity be an alternative framework for modeling agency and exchange?

1.5. Reciprocity.

Popular wisdom defines reciprocity as the *Golden Rule*, a maxim that describes an equal, two-way relationship by stating that one should treat others as one would like others to treat oneself. The Golden Rule can be found in different forms in almost every moral tradition (Blackburn, 2001). However, it should not be confused with generosity or altruism, as these signify a pure and detached act of giving away without expecting anything in return.

By studying alternatives to the current, widely-held notion that the economic behavior of human beings is *natural,*[63] developmental psychologist Michael Tomasello found that humans show strong tendencies towards cooperation and reciprocity. His experiments on how infants and primates behaved in situations where there was a clear choice between competition and cooperation suggested that

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[63] As discussed, the Rational Choice Theory assumes that *every* human being behaves according to economic criteria, and therefore seeks to *naturalize* such behavior. This strategy of naturalization may effectively rule out critique, as it presents economic values such as competition as universal and innate. The contemporary naturalization of competition may be traced back to various theories of society that emerged in the late nineteenth century in North America and Europe and were later grouped under the name of "Social Darwinism." Those theories claimed to have applied concepts proposed by Charles Darwin, such as *natural selection* or the *survival of the fittest* to the study of social and political dynamics. Supporters of Social Darwinism defended a view of society where only those with wealth and power should be worthy of competing to gain even more wealth and power, while weak individuals should be progressively excluded (Offer, 2000). Thus, from the perspective of Social Darwinism, the naturalization of economic behavior might appear as a strategy aimed at strengthening the power of the wealthy over the poor.

human cooperation may indeed be considered as an innate tendency (Tomasello, 2010). Tomasello depicted such tendencies as a *shared intentionality*, or the capacity of generating common intentions and compromises with others in order to achieve cooperative tasks (Tomasello, 2010). Shared intentionality is a form of human interaction that, according to Tomasello, has given rise to the most important cognitive feats of our species (Tomasello, 2010). However, even if shared intentionality can be considered to be innate, expectations of reciprocity modify it as human beings grow up and socialize. Thus, there is a balance between the innateness of cooperation and its molding into reciprocity through socialization and culture. Tomasello's experiments suggested that even small children show attitudes of identifying with *the other*, by complying with social norms and actively enforcing them on others (Tomasello, 2010). Norms based on reciprocity emerged when children lost their egocentrism and started seeing others as their peers. These norms became effective through a form of social contract founded on mutual respect, which may transform reciprocity into a guiding value for cooperation throughout life.

However, cooperation based on reciprocity is not a frictionless, purely harmonic form of interaction. In fact, cooperative behavior may, in many cases, conflict with survival instincts. Egoism, its opposite, is a necessary trait of every living being: without it, each individual's survival becomes compromised. As Tomasello claimed, our will to cooperate and be useful to others rests upon the basis of egoism. (Tomasello, 2010). Such claim implies that cooperation must be met with a corresponding reward, and that there must be some form of compensation for self-sacrifice. In many cases, the exchange of cooperation for rewards is regulated through coercion in the form of punishment applied to those who fail to cooperate. Thus, coercion stabilizes cooperation, but only as long as the punishment is regarded as a common good, that is, the punished person pays a price and everybody benefits from it (Tomasello, 2010). Paradoxically, under this perspective, the egoist foundations of cooperative behavior render a benefit that goes beyond pure self-interest.

Sociologist Marcel Mauss studied forms of reciprocity in different cultures. In his classic work, *The Gift*, a study of contract-based regimes in so-called *primitive*

societies, Mauss argued that gifts are never free (Mauss, 1971). From his studies in Northwestern American and Polynesian societies, he drew broad conclusions that he applied to the general notion of reciprocal exchange. Mauss found that the exchange of gifts is bound by three obligations: giving, receiving, and returning. Gifts that appear to be free may, in fact, generate obligations, and their exchange may correspond to different interests. These interests, and the coercive transactions that regulate the exchange of gifts, may be hidden by complex social formalisms or levels of symbolic abstraction. Gifts themselves are thus conferred a symbolic quality: what is exchanged is always much more than the gift itself (Mauss, 1971). Gifts involve credit, or reciprocity, which coerces the receiver into accepting it and corresponding by giving back. Unreturned gifts degrade those who accept them, and this degradation takes the concrete form of social punishment. The circulation of goods through reciprocal exchange stimulates social and economic life, as it is related to the circulation of people, rites, and language (Mauss, 1971).

1.5.1. Reciprocity and economic theory.

An important conclusion of Mauss's work is that, even if reciprocal transactions preceded the invention of money, this does not mean that they are less developed. Reciprocal economic exchange, in fact, often entails much more sophisticated forms of social interaction than the mere usage of money to pay for goods or services (Mauss, 1971). Mauss considered that pursuing individual benefit was fatal for the whole, and saw in reciprocity an alternative modality to economic exchange in societies based on indo-european law, where a separation between economic obligations and gifts may be observed (Mauss, 1971).

An important number of contemporary economists, prompted by the recent financial crises, have argued against economic rationality. According to Nobel laureate economics professor Paul Krugman, it was the notion of an idealized economy in which rational individuals interact in perfect markets, as proposed by the *homo economicus* model and Rational Choice Theory, that led to the crisis of neoliberalism (Krugman, 2009). Prompted by the financial crisis in 2008, Patel refuted the notion of *homo economicus*. Based on findings similar to those of

Tomasello, he claimed that, while the *homo economicus* model has only an instrumental interest on values such as generosity and cooperation, these are actually central to achieving economic prosperity and general well-being (Patel, 2010). From the perspective of the *homo economicus* model, cooperation can only be understood as a product of self-interested motivation, since it may yield personal benefits in the long term. This form of cooperation is also known as *weak reciprocity*, which contrasts with *strong reciprocity*. While *weak reciprocity* requires that exchanges be profitable for both parts (Guala, 2012), *strong reciprocity* is based on a propensity to cooperate with others similarly disposed, even at a personal cost, and a willingness to punish those who violate cooperative norms (Gintis et al., 2008). Studies in behavioral economics produced evidence that indicated that many people have a tendency towards *strong reciprocity*, that is, a tendency to voluntarily cooperate, if treated fairly, and to punish free-riders "even if this is costly and provides neither present nor future rewards for the reciprocator" (Fehr et al., 2002, p.2). In sum, these theories show that *strong reciprocity* can lead to "almost universal" cooperation, particularly in cases where there is a need to constrain potential cheaters and enforce social norms (Fehr et al., 2002, p.21).

In chapter 3 of this dissertation, I will discuss how strong reciprocity survives, albeit hybridized with other forms of organization, as a guiding political principle in the social contexts of the case studies. I will attempt to show how gift economies, which rely strongly on reciprocal social relations, coexist with monetized economies in those contexts, and how reciprocal relations may be understood as a basis for securing and strengthening the value of *voice* in face of the pervasiveness of economic rationality.

1.5.2. Reciprocity and the *commons*.

Because of its effectiveness in encouraging cooperation and punishing non-cooperators, strong reciprocity may be considered as a viable model of social behavior for the management of the *commons*. As argued, the *commons* is not produced by solitary individuals, but through a vast network of cooperative work. Strong reciprocal behavior may support the management of a common good that

might be depleted or degraded if not used according to a set of norms established by a community. These norms may include punishing overuse or the selfish behavior of free-riders. In their study of how individuals act collectively to manage shared natural resources in a sustainable way, Poteete et al. underlined the importance of information and communication for initiating and maintaining collective actions, as well as processes of decision-making (Poteete, Janssen, Ostrom, 2012). They claimed that in cooperative action, decision-making is based on three main factors:

1. Learning and adaptation.
2. Preferences and norms that take other individuals into account.
3. Heuristic strategies.
(Poteete, Janssen, Ostrom, 2012)

In most cases related to the management of a *commons*, it is unrealistic to assume that all individuals involved have complete information about the situation they are facing. Therefore, information and learning become crucial, especially in structurally complex cases, where underlying variables are subject to a constant and unpredictable change (Poteete, Janssen, Ostrom, 2012). An example of such a complex situation is the process of adaptation to climate change. As I will suggest in chapter 5, knowledge about adaptation strategies may become one of the most important resources that small-scale farmers can share. Furthermore, Poteete et al. argued that in the management of a *commons*, norms and experience may combine and become oriented towards reciprocal behavior (Poteete, Janssen, Ostrom, 2012). Over time, these forms of social cooperation can turn into heuristic strategies and techniques. These strategies are approximations of the costs and benefits that specific actions can have. When these actions become repetitive, heuristic strategies may reduce the amount of time and deliberation invested in decision-making. However, they may not be effective when there is a need to react quickly to changes (Poteete, Janssen, Ostrom, 2012). Again, the situations that arise from complex scenarios such as climate change call for constantly-shifting strategies for cooperation and reciprocity: experience-based techniques and social norms may need to be submitted to a process of continuous generation and transformation. As I will argue, the ERV Methodology was developed and applied in resonance to such a

call.

In order to achieve a dynamic environment for cooperation, Poteete at al. argued for the centrality of trust in social relations. In situations where certain trustworthy individuals are capable of corresponding to the positive and negative actions of others, levels of trust may become dynamic beacons for choosing between alternative norms of cooperation or finding new ones (Poteete, Janssen, Ostrom, 2012). Success or failure of cooperative action strongly depends on the levels of trust within those who manage a *commons*, and on the adoption of reciprocal norms by most of the participants who are involved (Poteete, Janssen, Ostrom, 2012).

A concrete example of how reciprocal, cooperative labor can act as a dynamic norm within a tightly-knit community can be found in the writings of Floriberto Díaz, an indigenous theorist who articulated the communal principles held by the Mixe people in Oaxaca, Mexico. His writings are particularly important to this research, since one of the case studies was conducted in Santa María Tlahuitoltepec Mixe (commonly know as *Tlahui*), one of the most important municipalities of the Mixe region of Oaxaca. Tlahui is governed by what is known as an *internal normative system* strongly based on the local concept of *comunalidad*.[64] The reciprocal basis of *comunalidad* extends to a general consideration of all living beings as equal subjects. It is precisely this interdependence of all beings that drives the need for mutual care and conservation (Díaz, 2007). *Comunalidad* is based on unpaid, mandatory, reciprocal labor, locally known as *tequio*. Díaz distinguished different forms of *tequio*:

1. Direct physical labor for the production of infrastructure such as roads, public buildings, or plots for farming.
2. Reciprocal aid among families, such as sowing, harvesting, or construction.
3. Attend*ing* the guests of communal *fiestas*.
4. Reciprocal exchange between different communities.
5. Intellectual work, understood as the compromise of sharing knowledge with

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[64] *Comunalidad* could be roughly translated as *commonality*. However, as I will attempt to explain in chapter 3, the concept of *comunalidad* developed by the Mixe thinkers of Oaxaca entails specific elements that are strongly tied to the local cultural and ecological context, and therefore I have chosen not to translate the term throughout this dissertation.

the broader community.

   (Díaz, 2007)

   The notion of *comunalidad* may exemplify how a social order can be based on different forms of reciprocal exchange. However, *comunalidad* coexists with a monetized economy in the Mixe communities of Oaxaca. This coexistence is by no means frictionless, as the communities must resist a continuous external pressure to abandon their communal forms, regarded as primitive and politically uncontrollable by Mexican capitalists and politicians. Under these circumstances, *comunalidad* may be seen as a form of biopolitical resistance and action in which *voice* is a key element, as it is spoken, listened to, and exchanged in the public assemblies that are regularly held in Tlahui.

1.6. *Voice* as reciprocal exchange.

   How can the reciprocal exchange of *voice* help to overcome its crisis? As discussed, the crisis of *voice* raises the need for alternative processes by which *voice* can be meaningfully exchanged in social and political contexts. Both the arguments of Poteete et al. (2012), from the perspective of social sciences, and Díaz (2007), from an indigenous perspective, stress the importance of *voice* as carrier of information and knowledge in the management and sustenance of a *commons*. Even if not explicitly, Poteete et al. (2012) argued in favor of a reciprocal exchange of *voice* by showing that trust and access to information are key values for a community concerned with managing common resources. For trust to be socialized within a community, and for information about a common resource to be made accessible in a social environment, *voices* need to be respectfully heard and exchanged. Similarly, Díaz (2007) identified the compromise of sharing knowledge with all members of a community as one of the possible forms that communal work might take. In Mixe communities in Oaxaca, this process is regularly carried out in the form of workshops or assemblies, where the *voices* of those who hold specialized knowledge are heard, and where everybody has the obligation to speak and listen.

   Thus, from the perspective of the *commons*, and from the perspective of

comunalidad, *voice* is regarded as a vehicle of the information and knowledge that binds the community together and becomes a crucial value for producing a form of social interaction that escapes the pure monetization of economic exchange. Because of the centrality of *voice* in such exchange, I also argue that the necessary conditions for strengthening *voice* as a value may be similar to those needed to strengthen reciprocity.

Following Mauss's studies on the reciprocal exchange of gifts and non-monetized forms of exchange, I propose that *voice* might undergo a transformation from its excessive, proliferating forms into a gift. The reciprocal exchange of gifts implies much more than a purely economic transaction. It is a complex system guided by the communally enforced principles of giving, receiving, and returning what has been received. It may be possible to draw a parallel set of principles for *voice*: if reciprocity is about giving, receiving, and giving back, the value of *reciprocal voice* would entail, correspondingly, the obligations of speaking, listening, and replying. Thus, the valuing of *voice* would necessarily entail the valuing of *silence*, but not as an absence of speech or as a self-imposed form of quiet compliance or apathetic indifference. Silence as a complement to voice means the ability to listen: to voluntarily refrain from speaking while others are doing so in order to better understand what is being said.[65] Thus, *voice* and silence might act as regulators for giving *voice* an active place in social exchange, and for limiting the cacophonous excess of *voice* that banalizes and devalues it. The reciprocal exchange of *voice* may contribute to recognize the uniqueness of each *voice* and, at the same time, recognize that *voice* is something we have in common, something that can be shared respectfully. It is not by coincidence that, in different cultures, the popular expression "I give you my word" is considered as a significant verbal contract of mutual compromise and respect.

Voice is a crucial element for building a new form of politics based on what we have in common. In Couldry's words:

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65 "By listening, we acknowledge each other's status as beings capable of giving an account of ourselves and the world we share" (Couldry, 2010, p.146). Philosopher Ivan Illich argued that silence could be regarded as a precious *commons* that, according to different traditions, was necessary for the emergence of a *person*. According to Illich, silence, which had given each man and woman his or her proper and equal voice, had ceased to be a *commons*, and instead was turned into a resource for which speakers loudly compete (Illich, 1983).

"... listening, constructing new spaces of relevance and new frames for making sense of *collaborative* action will require struggle: struggles oriented to the value of *voice* that challenge the legitimacy of existing *voice*-denying ways of doing things and build different ways of doing things in their place" (Couldry, 2010, p.148).

Speaking, listening and replying: such is the definition of *dialogue*. However, the reciprocal exchange of *voice*, a process that I have sought to enable through the ERV Methodology, seeks to enrich dialogic practices by endowing them with respect and reciprocal obligations, in which mutual norms of exchange are observed and sanctioned. According to philosopher Mikhail Bakhtin, cultures are dialogic: each one of its elements is a snapshot of a continuous process of dialogue. Through our voices and actions, we participate in such dialogues our entire lives, and only through dialogue do we know ourselves and the people with which we interact (Bakhtin, 1996). However, the *crisis of voice* may be progressively disrupting such process. François Jullien noted that one of the consequences of the media-driven excess of *voice* is the uniformization of lifestyles (Jullien, 2010b). Uniformity is not related with reason, but with economic production: it does not respond to needs, but to comfort and the reduction of costs. It neutralizes resistance and disappears into the background (Jullien, 2010b). Through uniformity, cultural dialogue may be replaced by the monologue of economic power. Consequently, Jullien proposed that strengthened dialogic practices could resist uniformity and contribute to a rediscovery of what we have in common, the common good: "It is directly in the conditions of meaningful discourse where the community of humans must be sought, conceived of as a communicational community" (Jullien, 2010b, p.185). Thus, by raising our *voices* meaningfully, the importance of what we have in common may be recognized. However, meaningful exchanges take time, and the excess and acceleration of commodified *voice* regards such time as a wasteful delay (Berardi, 2011). Therefore, resistance against the crisis of *voice* might entail a general slowing down of the exchanges of *voice* or, rather, allowing those exchanges to find a rhythm that may become autonomous from the rigid, accelerated pace of capitalist competition. The autonomous rhythm of meaningful, reciprocal exchange of *voice* may safeguard its value by becoming an alternative to uniformity and hegemony, and

thus become an expression of biopolitical subjectivity (Hardt, Negri, 2012).

Nevertheless, it would be a mistake to generalize the reciprocal exchange of *voice* as a basis of human interaction under a context-free methodology, since such exchanges may be highly variable due to cultural specificities. As Poteete et al. have observed, it is not wise to believe that a single, alternative behavioral model may replace the selfish behavioral model based on economic rationality. Instead, they posited that it may be more productive to formulate wide theoretical attributes of human behavior, such as reciprocity, which may be useful for explaining why individuals act differently in different situations. To explain cooperation in the production and management of the common good, for example, theoretical as well as specific aspects of behavior must be taken into account (Poteete, Janssen, Ostrom, 2012). Therefore, in this dissertation, I will focus on reciprocity as a theoretical tool from which an open-ended methodology may be derived and adapted to different environments. Furthermore, even if strong reciprocity entails coercion, I argue that reciprocity itself cannot be forced into social relationships. Jullien, resonating with Tomasello's empirical observations, situated reciprocity in the field of *responsivity*, that is, the affective perception of social interaction by which social norms might emerge (Jullien, 2010b). But how can the political potency of *voice* as reciprocal exchange be reinforced through social responsivity? As I will attempt to argue in chapter 5, the ERV Methodology seeks to activate responsive behaviors in order to encourage and strengthen the reciprocal exchange of *voice*.

1.7. Conclusions.

In this chapter, I have attempted to construct a theoretical background for *voice* and *reciprocity*. *Voice* may be considered as a communal toolkit, and as the medium for the symbolic construction of a community. I have tried to underline the relevance of *voice* in the field of politics, as well as the importance of making it heard throughout its different levels. *Voice*, as an instrument for political participation, may be considered as a form of agency, and a necessary element to achieve mutual recognition in a specific social environment. Because *voice* is intimately linked to the body, it can also be identified as a tool for embodied biopolitical action: a sounding

tool with the potential of creating political alternatives. The chorus of *voices* coming from a multitude may be considered as a biopolitical form of resistance that produces a *commons* as it unfolds. Significantly, part of the the *commons* that the *vocal* multitude produces is *voice* itself, together with the different contents it may carry.

I have argued that *voice* is presently found in a state of crisis that may be felt more strongly under the hegemony of economic rationalism, particularly in its neoliberal form. This crisis may be summed up in biopolitical terms: while the capacity of *voice* as an instrument for creating alternative subjectivities is being widely denied by the pervasiveness of economic rationalism, such denial is masked precisely behind the excessive proliferation of channels for *voicing out*. This paradoxical unfolding of the crisis of *voice*, however, cannot be understood in isolation from a broader crisis of agency. Social and political agency may tend to be limited through the internalization of neoliberal values and behaviors, such as self-interest and competition, which have influenced almost every aspect of human life.

I have proposed that a merely quantitative increase in the channels for *voicing out* may not be enough to restore the value of *voice* and, in fact, may actually contribute to deepen its banalization, its detachment from meaning. An excess of channels for *voice* might negatively affect its capacities to contribute to the construction of a community or the production of a commons and, ultimately, its possibilities of becoming a vehicle for the collective construction of alternative political subjectivities. Therefore, rather than multiplying the outlets for *voice*, I propose that it might be necessary to design qualitative methodologies that enable the construction of spaces for the reciprocal exchange of *voice*. As I will attempt to argue, the ERV Methodology seeks to enable the construction of such spaces.

As a way to counter the hegemony of competition and self-interested motivation, I have argued that reciprocity may not only become an economic model that can contribute to shape alternative possibilities for social agency and exchange, but also a more harmonic form of togetherness. Reciprocity does not consist of pure generosity or altruism, but is rather a sophisticated form of social exchange that entails the obligations of giving, receiving, and returning, and contemplates

commonly accepted norms for punishing those who fail to do so. I have argued that reciprocity directly addresses the dialogic aspects of culture, and may be regarded as a viable behavioral model for the management of the *commons*, which is both the source and the primary form of biopolitical production. I have proposed that the strengthening of the value of *voice* may pass through its consideration as crucial part of the *commons*, as it enables the exchange of the information and knowledge which are vital for its management and sustenance. *Voice* as a *commons*, therefore, may require that it can be exchanged reciprocally, under the mutual obligation and responsibility of speaking, listening, and replying.

Within a community, reciprocity may be enforced through coercion, but also by methodologies that seek to induce responsive behaviors. In the next chapter, I will explore the role of technology in the design of methodologies that may encourage and induce the reciprocal exchange of *voice*.

Chapter 2: Transforming Technologies to Enable *Reciprocal Voice*.

Introduction.

In chapter 1, I suggested that inducing reciprocal behaviors might entail a process of transformation and rewriting of internalized hegemonic values. Are these values somehow contained in the technological artifacts that we use in our daily lives? And, if so, does our continued usage of such artifacts reinforce the internalization of those values? May the values embedded in technology be rewritten so that they might induce reciprocity?

In this chapter I will explore how technologies may be transformed to encourage the reciprocal exchange of *voice*. As argued, social relations are increasingly mediated by information and communications technologies and therefore may become key elements in the process of encouraging and strengthening reciprocity. The processes of transformation to which these technologies might be subjected in order to achieve this goal will be researched in this chapter. The main assumption is that the standard modes of usage of information and communication technologies can be strategically transformed in a way that may encourage reciprocity and strengthen the value of *voice*. This assumption will be explored in a practical way in chapter 5. However, in order to examine it theoretically, the role of technology in social and political processes will be analyzed. I will analyze how the notion of *technology* has historically evolved, with the aim of identifying its role in social and political processes. Such analysis will also attempt to explain why technology, understood since Modernity both as foundation and driver of human progress, has assumed a central position in our contemporary societies. Moreover, philosophical discussions regarding the essence of technology trace theoretical tools that can enable a full analysis of the social and political role of information and communications technologies, particularly mobile phones and the Internet.

It is well known that mobile phones and the Internet can be used to integrate

voice into the vocal composition of a community and make its *voices* heard beyond its immediate social boundaries. But in parallel, as argued in chapter 1, the excess of technologies for amplifying *voice* may effectively contribute to erode its value. This paradox may be situated within the general ambivalence of technology which, in turn, is related to an additional paradox: technologies often solve problems by creating new ones. However, I will argue that the fragile ambivalence of technology may be ultimately unbalanced by economic interests, of which technology itself is a major driving force. This argument raises the question of whether technologies are designed and disseminated not only for the sake of solving problems efficiently, but also to satisfy hegemonic interests, such as the economic profit of large technological corporations, and whether those interests might override the potential benefits of new technologies.

I shall critique digital *solutionism*, a prevailing ideology which maintains that computer applications may solve any complex social, political, or environmental problem in such an efficient and *smooth* way that they make all other possible solutions seem primitive and inferior (Morozov, 2013). I will explore how this ideology tends to reject political deliberation and conflict, and will criticize these anti-democratic implications of digital *solutionism*. In order to understand digital *solutionism*, I will examine its predecessor, *technological determinism*: a reductionist vision based on the assumption that the higher ends of civilization may be reached through a neutral and autonomous technological development.

The standpoint of this chapter is neither the rejection nor the increase of technological solutions, but rather their transformation through subjection to reciprocal norms. As I will argue, subjecting technologies to reciprocity may entail reshaping the ways in which they are used. The transformation of technologies may happen at different moments within the design, manufacturing, deployment, and usage of technological artifacts and systems. Such transformation can go from a mere technical modification to a deep rewriting of the values embedded in technologies, and might create significant opportunities for increasing the political agency of its users in contexts where technologies mediate social interaction. Consequently, I will claim that it is possible to rewrite the values of technologies such as the Internet or

mobile phones in order to open up opportunities for the reciprocal exchange of *voice*.

2.1. The *malleability* of technology.

To what extent may technology be thought of as being *malleable*? *Malleability* will be understood here as the possibility of transforming a specific technology in order to rewrite its purposes, functions, and values. My analysis of the *malleability* of technology rests on three premises:

1. The *malleability* of a particular technology is not limited to the transformation of its material or functional aspects, but may also entail the re-purposing of its standard modes of usage. This premise assumes that cultural values are embedded in technology, and that those values play an important role in determining how artifacts are used.

2. Cultural values inscribed in technological artifacts are not fixed, but may be transformed through social processes which may become a field of political negotiation inscribed within the practice of biopolitics.

3. Transforming the values inscribed in technology is a worthwhile social and political pursuit, as it may become a crucial step towards strengthening the value of *voice* and encouraging reciprocal practices.

In order to investigate these premises, I will begin by tracing how the notion of *technology* as a cultural concept[66] came to be considered as a basis of *progress*, and how such consideration gave rise to technological determinism. As I will attempt to argue, the *malleability* of technology opposes technological determinism and thus

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66 The concept of *technology* in its current, popular sense, is relatively recent. Sociologist Leo Marx argued that, in the 19th century, there existed a conceptual void preventing the description of certain novel technical developments in applied science that were beginning to transcend the purely technical field by extending into the cultural realm (Marx, 2010). At that time, the terms *machine* or *machinery* were used to describe such technical developments, but their semantic limitations prevented a full explanation the social and political effects of the new technical artifacts. Although the term *technology* was notably used by philosopher Karl Marx in 1867, it was not formally introduced until sociologist Thorsten Veblen proposed it on the basis that machines had become a cultural force of wide-reaching consequence (Veblen, 2013). Veblen claimed that machines had become become a cultural force, since their operation had ostensibly displaced anthropomorphic habits of thought and practice and compelled workers to adapt to their design and modes of usage (Veblen, 2013).

deviates from the historical understanding of technological artifacts as *closed* objects, to which their users had to adapt unquestioningly.

By 1954, technology had become a well-recognized subject of philosophical discussion, when Martin Heidegger (2008) questioned its essence in his famous essay "The Question Concerning Technology," in which he claimed that the essence of technology was "by no means anything technological" (Heidegger, 2008, p.279). Heidegger meant that *technology* was not defined by the properties and functions of a technical object, but rather as a way of being and thinking that made specific worlds and modes of existence explicit. He sought to give a *universal* legitimacy to the term by understanding it in light of its Greek etymological root, *techne*. Heidegger related the notion of *techne* to the process of *bringing forth*, that is, the potential of *technology* to reveal the nature of the world and all that exists in it.

However, such potential has been progressively narrowed by the hegemony of modern forms of *rationality*. While economic rationality has significantly contributed to diminish the value of *voice* and *agency*, it is possible to argue that *technological rationality* has diminished the critical capacity to question the technical configuration of our social and political systems. In light of such diminished capacity, and in coherence with the assumptions of this chapter, I will claim that transforming technology may be a form of resistance against the hegemony of technological rationality. But how did technological rationality become a hegemonic force?

2.1.1. Technology as the basis of *progress* and technological determinism.

Despite the relative newness of the concept of *technology*, scientific knowledge and its applications in the form of machines and artifacts have long stood as the material and cultural bases of *progress* in Western cultures.[67] The modern

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67 In his *New Atlantis*, published in 1627, philosopher Francis Bacon described a utopian island inhabited by a perfect society, structured and organized according to the principles of a scientific institution, *The House of Salomon*. This institution was dedicated to "the knowledge of causes, and secret motions of things; and the enlarging of the bounds of human empire, to the effecting of all things possible" (Bacon, 1989, p.71). These ends were achieved primarily through empiricism, a theory credited to Bacon himself, which states that knowledge comes directly through sensory observation

idea of *progress* became closely tied to the accelerating rate of scientific and mechanic innovation and is commonly understood as a linear path that leads humanity towards ever-increasing freedom and happiness. This notion of a better world brought forth by technology resonated with Heidegger's question about the essence of technology. While Heidegger posited that the essence of technology was its *poetic* capacity to reveal the world, he also acknowledged its power to dominate (Heidegger, 2008). He claimed that the essence of technology could only be realized through its usage which, in turn, was destined to turn everything it touched into mere raw materials. Thus, Heidegger's *essentialism* may be stated as a claim that technology is a cultural form through which everything in the modern world is available for control (Feenberg, 1999).

Considering technology as the basis for human progress and the control of nature radically transforms our ways of being in the world. A broad understanding of technology acknowledges that, since the origins of civilization, our relation with the world has been *mediated* by artifacts and tools (Ihde, 1990). However, the modern conception of technology progressively moves beyond this mediation, generating an ever-increasing distance between humans and nature. To a large extent, *Modernity* may be understood as a historical project concerned with the emancipation of humans from the forces of nature and from *non-human* entities in general (Latour, 2007). In this movement towards liberation and control, technology has played a central role.

Is *technology* a key mover in history, with the power to emancipate humanity from the hazards of nature and lead it towards a higher end? Or should it be understood as being part of social, political, and cultural processes, and therefore subjected to contingency and conflict? Here, I will attempt to support the argument that *technology* is *malleable* because technological artifacts are not mere neutral

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and experimentation. Bacon's works helped to establish and disseminate inductive methodologies in science and inspired the foundation of the Royal Society in England, one of the oldest scientific institutions still in existence. The Royal Society, together with other similar institutions that arose in the 17th century, consolidated a scientific revolution marked by a new attitude towards the knowledge of nature (Dear, 1985). Whereas nature was previously regarded as a model to be imitated (Zeyl, 2013), the new scientific methods were aimed at its interpretation and understanding and, as a possible consequence, to its control and domination (Merchant, 2006). In this endeavor, science was applied to produce technical inventions that were considered as the means to observe and modify nature and extend the capacities of humans. In *New Atlantis*, Bacon foresaw developments in the mechanical arts that prefigured the mechanization of labor taking place a century later, with the advent of the Industrial Revolution (Serjeantson, 2002).

means whose unchangeable purpose is to reveal and control our world. If the development of technology is understood as a linear trajectory, free from cultural and political influences, then the *malleability* of technology would be limited to simple, occasional modifications of its shape and functions. But how can technology be fundamentally transformed? And what role can the malleability of technology play in processes that seek to reinforce *reciprocal voice*, such as those carried out in this research?

The view of technology as a *neutral* means to achieve higher ends, independently from contingent and conflictive intervention, is known as *technological determinism.*[68] After World War II, technological determinism intensely fed the notion that technological progress was unstoppable, as well as the myth of an infinite nature from which to endlessly draw resources (Feenberg, 1999; von Weizsäcker, 1980).[69] Technological determinism is supported by two beliefs: that technical necessity linearly dictates the path of development, and that this path is discovered through the pure, unfettered pursuit of efficiency and calculability. However, both beliefs may be questioned, since they present technology as a *decontextualized* phenomenon to which social institutions must adapt, and which supports a modern life ruled by productivity and control of the *irrational* elements in nature and society.

Various authors have related the supposed neutrality of technology with a *closure*: a process by which artifacts are produced as *black boxes* whose inner workings are no longer called into question but taken for granted (Feenberg, 1999; Pinch, Bijker, 1987). Before a *closed* technological artifact is produced, social interests are at stake in its design; however, once it becomes a *black box*, its often

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68 Technological determinism replaced the modern idea of progress by the end of the 19th century, under the influence of Karl Marx and Charles Darwin (Feenberg, 1999). Under this theory, technology was assumed to be *neutral*, as it merely fulfilled the end of serving a natural mandate, and thus the value it realized was generic in scope. Neutralization removed technology from cultural and political controversy, while claiming its autonomous functional logic (Feenberg, 1999).

69 While these ideas became widely popular in the 20th century, they did not go without criticism. In *The Technological Society* (1964), philosopher Jacques Ellul acknowledged the autonomous character of technology and argued that the "technical phenomenon" had become the defining characteristic of modern societies, as it imposed the necessity of efficiency on all human activities, regardless of political ideology (Ellul, 1964). He was pessimistic about the totalitarianism of technology, and therefore called for a spiritual transformation in response to its domination (Ellul, 1964). However, philosopher of technology Andrew Feenberg argued that critiques against technological determinism, such as Ellul's, had affinities with the cultural trend they aimed to criticize (Feenberg, 1999). According to Feenberg, such criticisms actually revealed that technological determinism, whether seen as a driver of progress or domination, rests on the fundamental notion of technological advance as autonomous and unilinear.

controversial social origins are forgotten. Sociologists Trevor Pinch and Wiebe Bijker understood the closure of technology as the stabilization of an artifact and the "disappearance" of the problems at the origin of its design (Pinch, Bijker, 1987). Feenberg posited that *closure* is the source of the deterministic *illusion* of technology unfettered by social and cultural influences (Feenberg, 1999). The fact that the process of closure may be described as an illusion is relevant to the main premise of this chapter, as it implies that technologies might never be fully closed to social intervention and transformation. However, the illusion of closure is a powerful one, and it is closely related to what is known as *technological rationality*.

2.1.2. Technological rationality.

In the decade of the 1960s, philosopher Herbert Marcuse radically critiqued the then-prevailing wave of technological determinism. Marcuse rejected the neutrality of technology and maintained that its essence was the result of social processes. Influenced by Karl Marx, he claimed that the logic of capital underpinned the logic of technology, and that this logic thereby produced individuals who became subjected to the totalitarian demands of a *capitalist rationality*, based on efficiency and the production of value. In his early work, Marcuse contrasted *individual rationality*, which emerged historically as traditional forms of authority were overthrown and democracy was introduced, with what he called *technological rationality*. With the imposition of *technological rationality*, Marcuse claimed that technology wiped out the individual[70] by reducing it to a series of automated functions that treated people as the appendages of machines. Marcuse exalted individualism by claiming that it was based on autonomous self-interest, whereas technology made self-interest heteronomous, only achievable through adjustment and compliance with an external, standardized rationality (Marcuse, 2004). In later writings, Marcuse shifted his focus from the technological constriction of individuality to the way in which technology became the means to establish social control and assert political power (Marcuse, 2010). Marcuse's rejection of the neutrality of technology was based upon his claim that technology embodied

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[70] Marcuse defined the individual as "the subject of certain fundamental standards and values which no external authority was supposed to encroach upon" (Marcuse, 2004, p.42).

ideology. Marcuse considered that the subversive capacity of contradiction found in dialectical thought was lost with the empirical scientific view that *truth* corresponded to *reality*. The ideology derived from this conception, known as positivism, thus became embodied in the "prevailing technical apparatus which in turn reproduces it," and therefore made it impossible to think of technologies as neutral (Marcuse, 2010, p.185). Marcuse saw this process as an obscure, closed one, and spoke of a *veil* that concealed the ideologies inscribed in technology (Marcuse, 2010). Because of this veil, technologies promoted a false consciousness that was immune to dialectical questioning, and thus inculcated what Marcuse called *one-dimensional* thought and behavior.

2.1.3. Technology and politics.

Marcuse's critique of technological determinism revealed that the *essence* of technology was not only cultural, but political as well. Marcuse argued that the exploitation of workers tended to become totalitarian as it extended beyond their physical skills, and well into their individual needs and aspirations.[71] Because of this, he wrote, technology was used by those in power to establish forms of social control (Marcuse, 2010). On this basis, *technological rationality* was understood by Marcuse as an essentially political program whose program was the domination of *man through* the domination of nature (Marcuse, 2010). This program became hegemonic by engaging individuals in their totality, which implied that individuals didn't need to adapt to technological rationality; instead, it became internalized through *mimesis*, or immediate identification (Marcuse, 2010). Such a process of identification required an active complicity from individuals, who could be compelled to imitate the seemingly perfect operation of technologies. Consequently, under regimes of accelerated and commodified *voice*, agency, and labor, machine-like operation in

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71 Marcuse was strongly influenced by Karl Marx, who described machinery in *Das Kapital* (1867) as technical means that were not intended to reduce the labor effort of workers, but rather to intensify their exploitation by capitalists, and to produce surplus value through mechanical labor (Marx, 2010). Previously, in his *Grundrisse* (1858), Marx had described machinery as objectified skills, that is, the process by which physical skills and strength came to be possessed and regulated by the machine instead of the worker, while the worker's activity was reduced to a mere abstraction (Marx, 2005). Thus, the political domination of the labor force under the rule of capitalism was achieved through the technification of labor. By describing machinery as objectified skills, Marx implied that such technification usurped the workers' abilities and effected upon them a progressive deskilling. By undermining the workers' importance in the process of labor and production, Marx claimed that they became merely the subjects of optimized and technified capitalist exploitation (Marx, 2005).

daily life may become not only desirable, but actually the only *reasonable* form of operation.

Because of the internalization of technological rationality, the political essence of technology may be understood not only as a rather abstract form of hegemony, but also as the embodiment of political power and authority in humans and machines. However, in contrast with criticisms in which it is accused of consolidating totalitarianism, technology has also been regarded as being a *democratic* force, as expressed by sociologist Lewis Mumford in his concept of *polytechnics* (Mumford, 2010).[72] But, as philosopher Langdon Winner argued, the democratizing and liberating power of technological artifacts has been largely overlooked or even neglected by those who advocate for technological determinism (Winner, 1988). Winner described, for example, how television was praised in the 1970s as an artifact with the power to create a whole new democratic world (Winner, 1988). But only three decades later, Nick Couldry identified the role of television in the neutralization of politics and the destruction of social fabric through its negative effects on deliberative language and its excessive glorification of freedom (Couldry, 2010).

Winner illustrated two ways in which artifacts may contain political properties: as instances where a technological artifact or system became a way of settling an issue in a particular community, or as cases of technological devices or systems strongly tied to particular kinds of political relationships. An example of the first instance may be found in Tlahui, the community in which I conducted the second case study of this research. The lack of fixed phone lines in every household was solved by members of the community, who invented a system known as *casetas*. A *caseta* is a communications system consisting of a household with a fixed telephone line and a megaphone placed on top of a tall pole. Any call to that line is usually destined to someone living in the community, so the person responsible for receiving the call uses the megaphone, which can be heard by everyone, to call out the name of the receiver, who is then supposed to run to the *caseta* to answer. The system of *casetas* not only solved the problem of access to telephone communication,

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72   Mumford's concept of *polytechnics* denotes different modes of technology that provide an intricate framework applied to address social issues, in contrast to *monotechnics*, which describes technology developed and used for its own sake (Mumford, 2010).

but also integrated coherently into the local political system, guided by the principle of sharing goods and services. However, the technological panorama in Tlahui may also offer an example of Winner's second instance of political properties of technology. During the case study, I found that cell phone coverage in the community was insufficient, as only a single antenna served a population of about 9,000 people dispersed throughout a mountainous terrain, in most of which the signal was out of reach (INEGI, 2010). While the remoteness of Tlahui itself might be one of the causes for this insufficiency, it may also be interpreted as the technological manifestation of a political will to limit the communication of indigenous communities with the *outside* world. This interpretation should be understood in the context of historically conflictive relations between the government of Mexico and indigenous people, but also in the light of the monopoly on the telecommunications market exercised by TELCEL, the largest mobile network operator in Mexico.[73] In this case, Winner's second instance may shed some light on how the design and introduction of technologies, such as the construction of cell phone antennas in Tlahui, may not always be motivated by an increase in efficiency, but also by multiple motives, among which is the desire for political control (Winner, 1988). The political properties of specific technological artifacts or systems represent a moral and political choice which, in turn, eclipses other sorts of reasoning. This view of technology implies that it might be more appropriate to describe a technological system as a *sociotechnical* system, that is, a systemic approach that describes the complex interaction between people and technology (Winner, 1988; Long, 2013).

It may no longer be feasible to understand technology and politics as separate domains, and therefore questions regarding the relation between technology and politics need to be posed: is technology political? Or are politics a branch of technology? Answering affirmatively to the first question may potentially strengthen political agency by opening up technology as field of democratic negotiation. However, the second one, which leads to *technocracy*, has apparently gained the upper hand. Feenberg defined *technocracy* as a "wide-ranging administrative system

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73 In 2012, TELCEL had 70 percent of the Mexican market share (OECD, 2012). On March 2014, an unprecedented anti-monopoly regulation was issued by the Mexican Federal Institute of Telecommunications, forcing TELCEL to share the market more equally with its competitors and lower its prices to end-users. (Source: http://www.jornada.unam.mx/2014/03/08/politica/004n1pol, retrieved 08.03.2014)

that is legitimated by reference to scientific expertise rather than traditional law or the will of the people" (Feenberg, 1999, p.4). Under this view, technocracy is closely related to technological determinism, and therefore to its authoritarian implications as well. In a technocratic regime, citizens tend to silently submit to the claims of the ruling experts and to perform subordinate roles. Dialogue is thus replaced by one-way communication: *voice* and *agency* may become devalued behind the facade of technical rationality. Technocracy, understood as a political ideology, may effect its influence on *voice* and *agency* through a process of internalization, as illustrated by the observations of critical theorist Catherine Belsey:

"Ideology suppresses the role of language in the construction of the subject. As a result, people 'recognize' (*misrecognize*) themselves in the ways in which ideology 'interpellates' them ... they 'work by themselves', they 'willingly' adopt the subject-positions necessary to their participation in the social formation" (Belsey, 2002, p. 57).

However, Feenberg claimed that the hegemony of technocracy may not be as total as feared and that resistance to it may still be possible (Feenberg, 1999). Even Marcuse, one of the most radical adversaries of technocracy, argued that the transformation of technology could also become the transformation of politics, and that it could lead to a qualitative improvement of social life if technical development was redirected towards an alternative rationality (Marcuse, 2010). Marcuse's redirection of technological development was a call for the "pacification of existence," or the transformation of the struggle between humans and nature into a form of organization that escaped the accumulation of power, competition, political domination, and the destruction of the natural world (Marcuse, 2010, p.54).

2.1.4. *Malleability*

So far, I have attempted to justify the main assumption of this chapter, which opposes technological determinism and its associated notion of neutrality while emphasizing the social and political importance of the *malleability* of technology. If, as I have argued, technologies are inscribed with political values and ideologies, it

follows that the illusion of technocracy as a *pure* form of government may need to be deeply questioned. Moreover, technology can be regarded as *malleable* because it is essentially the product of complex social, cultural, and political processes. If the political properties of technological artifacts and systems represent a particular choice between different possibilities, then transforming the design and modes of usage of those artifacts might serve to modify their properties by activating immanent alternative values. I will attempt to argue that the capacity of transforming technology in such a way may be considered as a counter-hegemonic manifestation of biopolitical agency.

Although technology has significantly contributed to improve many aspects of human life, its design and development has been progressively adjusted to serve hegemonic interests. These interests are embedded in the very design of technological artifacts and systems, their procedures and modes of usage (Feenberg, 2002). The social constructivist approach argues that the development of technologies is the fruit of a process of decision and consultation, in which concerned social groups may take part (Pinch, Bijker, 1987). This approach presents a democratic picture of technological development by assuming that the components of technological systems are socially constructed, since they were invented by systems builders and their associates (Hughes, 1987). These inventors, in turn, may act as *engineer-sociologists* who constantly consult diverse social actors and incorporate their views into the process of design and development (Callon, 1987).

While these assumptions may be accurate in some cases, I suggest that they are largely contradicted by the prevailing methodologies of contemporary technological development. The design, development, and manufacture of a vast majority of current technological systems is entrusted exclusively to expert teams of scientists, engineers, and technicians working in highly specialized laboratories and manufacturing facilities. Moreover, such processes often happen within proprietary settings that tend to mask their conceptual and physical constituents for the sake of a wide variety of reasons, including security, economic interests, or protection of intellectual property. Finally, the implementation of technological systems often happens in social contexts that are far removed from the context in which they were

designed. Closed, expert-driven design processes, together with decontextualized implementations of technological systems, deeply question the social constructivist approach and become evident in examples such as the mobile phone or, more accurately, the sociotechnical system of mobile telephony.

The mobile phone, a very optimized and miniaturized computer, may only be designed by highly specialized engineers and manufactured using extremely sophisticated materials and machinery. While some of its features may respond to popular demands made by its users, most of them are simply offered as *innovations*, which might not always be the fruit of social consultation. As a global technology, mobile phones are disseminated together with mobile network infrastructure, forming a system that expects users of all cultures to adapt to it. Such a process of adaptation may be extremely problematic, not only because of the skills it requires and the physical necessities it creates. It may also conflict with local cultural values, especially those tied to communal social orders, as the mobile phone is conceived essentially as an artifact that belongs to and is used by an individual. Mobile telephony is a sociotechnical system with many components that, as the case of the single cellphone antenna in Tlahui suggests, may be implemented in a top-down, authoritarian way. In such a scenario, transforming the embedded values and modes of usage of sociotechnical systems, as I have practically attempted in this research, may become an effective counter-hegemonic statement.[74]

Transforming technology is not merely a question of deviating from the implicit and explicit norms in a sociotechnical system, but rather a social act of reshaping its program and building an alternative *anti-program* (Feenberg, 1999). If contemporary technologies may be thought of as being "global," particularly those related to large communications networks, then the process of reshaping them may happen as a "local" tactical resistance (Feenberg, 1999). Experts often call into question the very right of the public to transform technology, for the sake of efficiency or security. Consequently, transforming it may become a counter-

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74 Fairphone is a notable example of how mobile phones can be designed, developed, and manufactured in ways that are socially responsive. Fairphone, a mobile phone company based in the Netherlands, began to manufacture phones in 2013 and defines itself as "a social enterprise with the aim to develop a smartphone designed and produced with minimal harm to people and planet." http://www.fairphone.com/ (retrieved 04.03.2014)

hegemonic act of questioning the normative authority of technology (Feenberg, 1999). However, such transformation may be carried out by different actors, in different ways and for different reasons. Local actors with vested interests are among those most likely to undertake this process. Technology may also be transformed unwittingly, as if by chance, by people who did not consciously set out to reshape it (Banks, 2013). Furthermore, the subject of transformation may be a single technological artifact or a larger sociotechnical system. The *casetas* in Tlahui may be understood as a transformation of the usage of a fixed phone line by making it available to an entire community and not just a single person or household. But the *casetas* may also be understood as a reshaping of the social life in Tlahui: new responsibilities and interests emerge, physical spaces are redefined, organizational strategies for the system's maintenance are put in place, and so on. The motivations to transform technology may be varied: from solving a specific problem or satisfying a need, to making a political statement or, as I have attempted in this dissertation, to encourage the reciprocal exchange of *voice*.

Feenberg argued that the "interpretative flexibility," that is, the degree of openness with which a technology may be interpreted by its users, may lead to its transformation (Feenberg, 1999, p.126). When attempting to transform information and communications technologies, as I did in the practical case studies in Tanzania and Mexico, actions may go beyond shaping computers' design and technical functions to changing the very forms of communication they make possible. Therefore, I will not focus on the intervention of users in the design of such technologies, but rather on the transformation of their standard modes of usage, as determined by their embedded *program*. This type of transformation implies shifting attitudes towards technology and, according to Feenberg, may actually be more realistic and effective than struggling to influence its design (Feenberg, 1999).

The social transformation of technology may be inscribed within the field of biopolitics, because it seeks to provoke a bottom-up shift in the political order by reclaiming control from the rule of top-down technocracy. Feenberg explicitly connected the transformation of technology to biopolitics by finding in Foucault's work a form of resistance: an alternative technical strategy to the technocractic

exercise of power (Feenberg, 2002). Strategic resistance in the sphere of technology is about privileging excluded values and the publics that articulate them, in face of the operational autonomy of the systems that a technocratic order seeks to achieve and implement (Feenberg, 2002). In the following sections, I will attempt to analyze ways in which the biopolitical transformation of information and communication technologies can be used to strengthen *reciprocal voice*.

2.2. Information and Communications Technologies

Today, two of the most salient technologies in the field of information and communications technologies, the Internet and mobile phones, are transforming *voice* and politics. The Internet and mobile networks, which have technically converged in an almost seamless interaction, have become increasingly pervasive technological mediators of connective social relations. Currently, being disconnected is practically synonymous with being excluded. Being connected has thus become an hegemonic social status that engulfs almost every aspect of daily life: from labor to leisure, from politics to intimacy.

Indeed, the values and ideologies that are inscribed in information and communications technologies may be understood both as models and platforms for politics. But what are their effects on *voice* and political participation? Can the process of transforming these technologies be considered as a counter-hegemonic struggle that is fought within their very core?

These questions are closely related to one of the main discussions of this chapter: the *malleablity* of technology versus technological determinism. In the case of information and communication technologies, technological determinism may be more aptly understood by studying cyberlibertarianism, a trend that has prevailed since the concept was originally conceived.

2.2.1. Cyberlibertarianism and the economic history of the Internet.

The histories of the Internet and the World Wide Web are well-documented (Leiner et al., 2013; Berners-Lee, 2000; Castells, 2001). Here, I will focus on the ideology that guided the design of the Internet, and its implicit and explicit relation to politics. Despite the fact that the Internet was originally engineered in the US as a military communications project, its functional and structural principles inspired a wave of libertarian ideas. The "Magna Carta for the Knowledge Age," for example, exalted *cyberspace* as "the land of knowledge" and claimed that its exploration could be "civilization's truest, highest calling" (Dyson et al., 1994). *Cyberspace* was offered as a solution that would alleviate the pressure on modern infrastructures, such as highways or cities, while improving lives by expanding leisure and "family" time (Dyson et al., 1994). Under the influence of economic liberalism, it was also presented as a field for dynamic competition and a new source of financial wealth (Dyson et al, 1994).

Anarchism also influenced early views of the Internet. In his well-known text, "A Declaration of Independence of Cyberspace," writer John Perry Barlow asked the "tyrannies of the past," represented by the governments of the industrial world, to "leave us alone" (Barlow, 2001, p.28). "I declare the global space we are building to be naturally independent of the tyrannies you seek to impose on us" (Barlow, 2001, p.28).

Although the libertarian and anarchist visions may symbolize the opposing ends of the political spectrum, they are both deeply permeated by a common ideology akin to neoliberalism. As argued, self-interested competition, economic deregulation, and privatization are the flagships of neoliberalism. In order to put those ideological features into practice, it is essential to reduce the political capacities of governments while strengthening the private sector. Therefore, by asking governments to *leave us alone*, or by envisioning an expanded, decentralized field of economic competition, the early utopian visions of the Internet, I posit, may be understood as calls that have effectively intensified different aspects of neoliberalism. These visions may also reveal a heavily determinist stance by portraying the Internet as a *neutral* technological system that would serve humanity to achieve its higher ends. Langdon Winner called this ideology *cyberlibertarianism*

and identified it with the radical individualism of right-wing libertarianism (Winner, 1997).[75] Winner argued that *cyberlibertarianism* contributed to obfuscate the social transformations that the new digital networks brought about and showed little concern about issues such as injustice or inequality (Winner, 1997). Moreover, the *cyberlibertarian* notion of community, materialized in the *online* communities that started to proliferate in the early nineties, was a shallow and impoverished one. This notion was practically reduced to *warm and fuzzy* experiences of virtual connection that ruled out heterogeneity, conflict, and the obligations of reciprocity found in physical communities (Winner, 1997). Consequently, cyberlibertarian values may be regarded as factors that potentially erode deliberation and strong reciprocal exchanges.[76]

The economic history of the Internet and the World Wide Web may be seen as a progression from non-commercial, open networking, towards commodified, proprietary services. It may also be seen as a progressive movement of neoliberal consolidation and, consequently, as a sociotechnological environment in which *voice* and reciprocity are increasingly subjected to economic rationality. Online businesses started to appear on the World Wide Web quickly after the introduction in 1993 of Mosaic, the first graphical web browser. A few years later, between 1997 and 2000, a speculative bubble in which the Internet sector of international stock markets saw spectacular rises took place.[77] Many investors got carried away by this sudden economic bonanza and willingly overlooked traditional financial metrics for the sake of quick and easy profit, causing the bubble to finally collapse in 1999.

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75 However, as suggested, the radical individualism of cyberlibertarianism might be identified with anarchism as well.

76   The influence of the cyberlibertarian ideology, which emerged in the 1990s together with the World Wide Web, may still be felt today. Recent proprietary platforms for social networking, such as Facebook, are still designed to exclude conflict and dissent. Interestingly, a large number of users of Facebook made explicit demands on its owners, asking them to design a more realistic social experience by introducing a function to dislike others' opinions (Cashmore, 2010). However, Facebook rejected these demands on the basis that a dislike button would potentially damage the company's relationship with brands, who provide financial support in exchange of advertising, and who might not like it when users disliked them (Cashmore, 2010). Facebook's concern that conflict and dissent might scare off investors illustrates the strong interdependence between digital networks and the neoliberal economy. Furthermore, Facebook is an example of what political economist Vasilis Kostakis and Michel Bauwens, founder and director of the Peer-to-Peer Foundation, have identified as netarchical capitalism: a new segment of the capitalist class that is no longer dependent on the ownership of intellectual property rights nor on the control of media vectors, but rather on the development and control of participatory platforms (Kostakis, Bauwens, 2014). Thus, Facebook would also illustrate how capitalism tends to co-opt participation for the sake of profit making.

77   At that time, it was claimed that Internet-based companies, commonly referred to as dot-coms, could cause their stock prices to increase just by adding an "e-" prefix to the ".com" at the end of their names (Maznick, 2003).

In 2004, the Internet attracted a second wave of financial interest when a set of dynamic services and platforms that emphasized interactivity and collaboration prompted the rebranding of the Web as *2.0* (O'Reilly, 2005). However, the newness suggested by the term *Web 2.0* was misleading, as the technologies associated to it were already in place since the early days of the web. Thus, the *2.0* rebranding could be understood primarily as a marketing strategy aimed at regaining the favor of investors after the burst of the speculative bubble (Scholtz, 2008). Nevertheless, the versioning strategy was successful, and this new period saw the emergence of popular (and, in most cases, profitable) web platforms such as Wikipedia, YouTube, and Facebook, which quickly became hubs for online collaboration and social networking.

The advent of *Web 2.0* introduced a rhetoric shift in the cyberlibertarian discourse. In 2006, *Time* magazine declared *you* as the "person of the year," praised "the many wresting power from the few and helping one another for nothing," and claimed that the Internet would "not only change the world, but also change the way the world changes" (Grossman, 2006). While the cyberlibertarianism of the 1990s heralded radical individualism, the *2.0* libertarian vision exalted community and collaboration and made enthusiastic calls to harness the power of *collective intelligence* (Lévy, 1999, O'Reilly, 2005). A supposedly *malleable* web was announced, offering the opportunity "to build a new kind of international understanding, not politician to politician, great man to great man, but citizen to citizen, person to person" (Grossman, 2006). However, this new rhetoric retained the core values of cyberlibertarianism and introduced a new model in which pro-business, right-wing libertarianism and social causes mixed together in a technocapitalist bundle. In this model, economic value would be generated by technological enterprises driven by a conflict-free notion of community, together with the application of computer algorithms to solve social issues. This renewed cyberlibertarianism maintained that society's problems could be solved if they were treated as engineering problems and that their solution could generate financial profit. Such is the ideology of the current form of technocracy, in which the hubris of computer expertise combines with financial power.

2.2.2. Digital *solutionism.*

Media theorists such as Evgeny Morozov or David Golumbia have criticized this new trend of technocracy. Morozov claimed that this ideology tends to legitimize the recasting of complex social situations either as neatly defined problems with definite, computable solutions or as transparent, self-evident processes that can be easily optimized (Morozov, 2013). He called this ideology *solutionism* and, in agreement with Golumbia, claimed that it may have unexpected consequences that could eventually cause a damage greater than the problems it seeks to address (Morozov, 2013, Golumbia, 2013). Golumbia added that this new technocratic ideology, which encouraged mass computerization, emerged from the political right and thus served to spread rightist principles even if they are cloaked in leftist rhetoric (Golumbia, 2013). In chapter 4, I will discuss how *solutionism* is a principle that strongly guides the technological applications aimed at improving the livelihoods of small-scale farmers and will discuss its potential effects and risks.

2.2.3. The architecture of the Internet as a model for politics.

As argued, the implications of technological determinism can be closely tied to authoritarian interests. Therefore, if the cyberlibertarian ideology is the digital version of technological determinism, its goals of neutralizing politics, dissolving hierarchical structures of power, and resolving social conflicts with a simple technological *fix* might be understood as forms of authoritarianism as well. Cyberlibertarianism may have in fact contributed to the intensification and dissemination of neoliberal hegemony which, as discussed in chapter 1, tends to devalue *voice*. However, if power is based on the control of communication, as sociologist Manuel Castells argued, then it may be possible to see how the Internet can become a model for unprecedented forms of power that may be fundamentally different from those traditionally exercised in politics (Castells, 2009). But what kind of politics may the Internet offer?

It is possible to say that the architecture of the Internet offers a potential political model rooted in the notion of networks, and that this model contrasts with

traditionally hierarchical politics. However, political scientist Jodi Dean argued that the Internet could not be understood as a *public sphere* (Dean, 2003), since the widely used notion of public sphere, as proposed by sociologist Jürgen Habermas, consists of a democratic setting for deliberation based on the value of consensus. Yet, as argued earlier, social networking platforms tend to favor frictionless consensus. While this might suggest that such platforms could possibly foster a digital version of the public sphere, they actually contribute to its disintegration by allowing users to *create* their own individualized spheres of communication and information, in which only what they *like* is included and *the other* is left out (Han, 2013). Therefore, considering social networking platforms as spaces for traditional democratic deliberation and change might become untenable. Consequently, Dean argued that the intensification of networked communication may not necessarily yield more democratic practices, but instead a *communicative capitalism* characterized by a "deluge of screen and spectacles" that undermine political efficacy (Dean, 2003, p.102). The net effect of a communicative capitalism is therefore an abundance of empty participation, or participation for its own sake, and, as several theorists have suggested, may cause a growing sense of fatigue (Han, 2012; Berardi, 2011) and a progressive withdrawal from participation itself (Sloterdijk, 2000). Under *communicative capitalism*, communication networks have the capacity to discipline citizens and reformat politics and participation in terms of marketing and spectacle, displacing public attention from actual antagonism. Nevertheless, Dean underlined the potential of *communicative capitalism* for allowing multiple conflicting constituencies to eventually understand themselves as part of a common global structure. In such a scenario, it would be the heterogeneous multitude and not the uniformed citizen who emerges as the central political subject. Consequently, it may be the exercise of biopolitics and not of democracy in a public sphere that appears in the horizon of politics. But could the communicational architecture of the Internet offer a model for politics without the notion of consensus? Such a paradoxical site of potential conflict and contestation might, in the light of biopolitcs, be understood as a space for the reciprocal exchange of the *voices* of the multitude and the production of a *knowledge commons*.

What is the architecture of the Internet? And which values are inscribed in its

core? The Internet may be understood as a sociotechnical system traversed with values that are nevertheless rendered invisible by its supposed neutrality. In contrast with the cyberlibertarian ideology, media theorist Alexander Galloway argued that the Internet is not intrinsically libertarian or free, and that its *essence* is defined by the technical protocols that operate at its core (Galloway, 2004).[78] Those protocols present a dual system that brings the Internet under the control of a dynamic mechanism that is both peer-to-peer and hierarchical, multiple, and centralized.[79] In this protocol-based operation of digital networks, Galloway saw a "delicate dance of control and freedom" (Galloway, 2004, p.75), and, therefore, argued that the Internet could be regarded as a field of contestation where resistance is not "outside the protocol but at its center" (Galloway, 2004, p.176). But what kind of politics may be favored by this paradoxical architecture? Does the Internet offer the possibility of strengthening *reciprocal voice*?

2.2.4. The Internet and *reciprocal voice*.

Critical theorist Joss Hands argued that the architecture of a distributed network requires reciprocal connections, and thus has mutual recognition built into it (Hands, 2011). While it may be possible to see communication in digital networks as an analogy to the reciprocal exchange of *voice* proposed in chapter 1, I suggest that it is necessary to be cautious when associating digital networks with reciprocity. The technical protocols of the Internet were designed and implemented with the aim of making multi-point data transmission more efficient and robust, and not for the sake of egalitarian communication. Indeed, those protocols enact linking and reciprocity but, at the same time, they enforce centralized, non-reciprocal control, as Galloway noted. Furthermore, network theory shows that distributed networks are not

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78 The Internet is technically defined by a series of standard protocols that allow the communication and interoperation of computers connected to a network. The Transmission Control Protocol and the Internet Protocol (TCP/IP) are the protocols that allow computers to communicate with each other. Because of the way TCP/IP is designed, any computer on the network can talk to any other computer, resulting in a nonhierarchical, peer-to-peer relation. However, TCP/IP works together with the Domain Name System (DNS), which translates domain names to their corresponding IP addresses. In contrast with TCP/IP, the DNS protocol is based on hierarchies, since the translation process it performs is rigidly ordered in different levels of domain identification, each of which has authority over lower levels. Thus, while TCP/IP allows any two computers in the network to communicate with each other directly, their communication is subjected to the centralized *resolution* of their addresses performed by DNS.

79 Media theorist Boris Groys takes this paradox even further by arguing that, even if protocols and software were reshaped so as to follow a strict peer-to-peer, non-hierarchical model, they could still be regarded (somewhat ironically) as "communist software" running on "capitalist hardware," since the machines and cables that constitute the materiality of the digital medium are, almost invariably, centrally owned by large corporations (Groys, 2010. p. 127).

nonhierarchical, but polyhierarchical. A network such as the Internet follows a *scale-free* mathematical model (Barabási, 2003). According to this model, the addition of new nodes to the network results in the formation of *hubs*, or central nodes that have more connections than regular nodes.[80] This phenomenon may be observed in the emergence of large hubs on the World Wide Web, owned by corporations such as Google, which tend to monopolize and control online communication and services. Therefore, while the operation of network protocols may be based on reciprocal communication and mutual recognition, the actual manifestation of *voice* on the Internet may be constrained by forms of control subjected to technological and economic powers. Power, as Foucault posited, is not a substance or an attribute, but a particular form of relationship between individuals (Foucault, 1990b). If relations within *scale-free* networks are understood as relations of power, then the Internet may be revealed as a polyhierarchical space in which great inequalities exist. Power is distributed throughout the network, yet its concentration in hubs conditions and constrains communication and *voice*. Consequently, I suggest that the existence of strong hierarchies on the Internet may limit and undermine its potential as a platform for the effective delivery and articulation of *reciprocal voice*.

However, I claim that the architecture of the Internet is *more compatible* with reciprocity than that of earlier communications technologies, such as radio or television, and therefore may potentially lend itself as a more suitable tool to encourage *reciprocal voice*. Nevertheless, it must be acknowledged that the interaction between individuals on the Internet is constrained by its protocols and algorithms, and that such constrictions may introduce technological rationality in communication. Resonating with Berardi's warnings against the *mathematization* of language introduced by digital communications, Castells argued that the protocols that rule network communication create a language in which processes and algorithms tend to obscure content (Castells, 2009). *Voice* may thus be impoverished and reduced to quick and short linguistic exchanges, in which the interest in what is said expires quickly. Twitter[81] is a notable example of the fleetingness of language in

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80   The formation of hubs in scale-free networks follows preferential attachment, a statistical rule that states that a new node's probability of connecting to an existing one is proportional to the latter's number of connections. Thus, highly connected nodes are more likely to acquire even more connections than other nodes, giving way to network-specific hierarchical dynamics colloquially known as "the rich get richer" (Barabási, 2003).

81   Twitter is a popular social networking platform that enables users to send and read text messages of up to 140

digital platforms. The constraint imposed by Twitter, which limits the length of its text messages to 140 characters, suggests that the crisis of *voice* as a political instrument may not only be found in the excessive proliferation of technologies for disseminating voice, but also in the communicational model offered by those technologies. But, whereas Dean argued that such a model could nevertheless be the basis of a new form of politics based on contestation, Castells claimed that global network culture may be regarded as a culture of communication for the sake of communication (Castells, 2009). In light of this controversy, I propose a double claim regarding the Internet as a model for *reciprocal voice*:

- That, in order to effectively adopt the Internet as a model for *reciprocal voice*, it is necessary to create a strong link between the modes of communication allowed by its architecture and the physical structures of the public sphere as it currently exists.

- Even if networks offer a *communicative capitalism* instead of a public sphere, their political potential cannot remain enclosed by the very limits of the network. Thus, I also claim that it is no longer desirable to speak about a dichotomy between *cyperspace* and physical space. Instead, it may be possible to build a hybrid political space where *online* and *offline voices* may coexist and interact.

As I will discuss in chapter 5, the ERV Methodology aims to address these claims by enabling and bridging *online* and *offline* modes of social interaction, thereby attempting to construct an environment for *reciprocal voice*.

So far, I have argued that the Internet may offer a model for unprecedented ways of exercising politics. I will now discuss its possibilities for encouraging *reciprocal voice* and will argue that its bottom-up transformation is essential for the realization of those possibilities.

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characters. http://twitter.com (retrieved 05.03.2014)

2.2.5. Transforming the net: the Internet as a platform for politics and art.

The political history of the World Wide Web may be seen not only as a process of mutual consolidation between digital communications networks and neoliberalism, but also as a parallel and progressive scenario of political struggles that have served to amplify the causes of different social movements. In spite of the deterministic ideologies and the economic interest that pervade the networks, it is possible to claim that the Internet can also become a space of solidarity and inclusiveness: a space where *voices* can be exchanged respectfully and reciprocally. The Internet is a political platform, and I will argue that the struggle over its transformation lies at the core of its very existence.

Jodi Dean claimed that the conflict over configuring the web was, at the same time, a conflict over the configuration of the global political order (Dean, 2003). Under this perspective, the struggle becomes a form of resistance against the hegemonic rationalities embedded in the web that, according to Castells, takes place through and by the networks (Castells, 2009). In his claim, Castells echoes Foucault's notion of resistance not only as the mere denunciation of power, but also as a deep questioning of its rationalities. As discussed, resistance is an essential component of biopolitics, and thus resistance to networked power may be understood as an element of biopolitical struggle. Therefore, the capacity to resist hegemonic rationalities and produce a multivocal *commons* of knowledge and information seems to be at stake in the struggle for the configuration of the Internet.

On one hand, the Internet offers the possibility to strengthen values such as reciprocity and solidarity, but on the other, it offers a hyperaccelerated, abstract space for radical competition, commodification, and the neutralization of *voice* and politics. The tension between these possible worlds began in the early days of the Internet and is still being intensively fought. The actors in this struggle are, on one side, a heterogeneous multitude of users who defend freedom and openness in networks and, on the other, governments and large corporations who apply all imaginable means to impose control. This tension reveals that the transformation of

the Internet is certainly a socially constructed one, but not in the way that social constructivists have proposed. Rather than a more or less ordered process of decision and consultation over the configuration of a specific technology, transformation takes place as an uncoordinated, chaotic movement that is at the same time local and global, and in which dissimilar interests converge and conflict. Because of this multivocal, chaotic process, the technological stabilization of the Internet is still far from being an accomplished fact, therefore turning its closure into a matter of political struggle. Information theorist Leah Lievrouw proposed that the *reconfiguration*, or the capacity of users to modify the networks to suit their various purposes, is one of the hallmarks of this movement (Lievrouw, 2011). Reconfiguration, as carried out by diverse social movements on the Internet, is directly associated with the arguments about the political relevance of technological *malleability* I have discussed here.

2.2.5.1. Social movements on the Internet.

Castells suggested that the articulation of a social movement over the Internet becomes both its organizational form and its mode of action (Castells, 2009). However, recent social mobilizations, such as the so-called Arab Spring or the Occupy movement, blur the distinctions between online and offline activism and suggest that digital networks may no longer be considered as central to their articulation as Castells proposed. Nonetheless, Lievrouw claimed that social movements are fundamentally communicative and that they would scarcely be possible "if participants could not interact, recognize, and articulate shared values and goals, form and maintain relationships, share information and advice, represent issues and viewpoints, debate controversies, and express themselves and their interests both in person and via media channels" (Lievrouw, 2011, p.161). A social movement may be understood as a process in which collective *voice* interweaves with collective *agency* to bring about change. However, neoliberalism tends to limit *voice* and agency, and therefore may be a natural antagonist of social movements: if not their only one, probably their most formidable. Contemporary social movements, Lievrouw argues, manifest a cultural logic of networking that is expressed in their structures and communicative actions but, as I will argue through the analysis of the

case studies in this dissertation, does not have to be limited to mere *online* action and articulation.

The *open source* movement is a significant example of how the biopolitical struggle to reshape the Internet from within its very core may successfully contribute to its transformation. The movement was created around the idea of defending free access to software code, often developed in a public, collaborative manner, and therefore considered as a knowledge *commons*.[82] It clearly stood in opposition to the closed, proprietary software model offered by corporations. Thus, the *open source* movement may be understood as a community-based struggle against those economic interests that tend to enclose the *commons* for the sake of profit and control. Since its origins, which can be traced back to the GNU project and the Free Software Foundation (Stallman, 1999), the movement has successfully reshaped the architecture of the World Wide Web by collaboratively developing what is considered as one of its most stable platforms.[83] However, its influence can be felt beyond the scope of software and digital networks and software and has inspired other organizations such as Open Knowledge[84] or the P2P Foundation.[85]

The *open source* movement, which consists of a network of communities articulated by the Internet, exemplifies how the small-scale, localized actions of members of a social movement, which Lievrouw calls *microcontributions*, can achieve a global political impact (Lievrouw, 2011). From the perspective of

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82   The definition of Open Source offered by the Open Source Initiative, an organization dedicated to promoting open source software, does not restrict its scope to open access to source code. Instead, it considers a wider set of additional criteria, such as free redistribution, the possibility of modifying source code, and creating derived works, acknowledging authorship and excluding discriminatory or restrictive licenses (Source: http://opensource.org/definition, retrieved 24.04.2015).

83   The software bundle known as LAMP (Linux, Apache, MySQL, PHP) has become a de facto development standard for web servers. Consequently, its components are normally included by default in all distributions of the Linux operating system, and all of them are the fruit of continued development by open-source communities (Source: http://www.webopedia.com/TERM/L/LAMP.html, retrieved 24.04.2015). The software tools developed specifically for the ERV Methodology are largely based on the LAMP platform, as discussed in Appendix A.

84   Open Knowledge is a worldwide non-profit network dedicated to using advocacy, technology, and training to unlock information and enable people to work with it to create and share knowledge. The Open Knowledge network aims at working with public and private institutions around the world to help them become more comprehensive and accountable by opening up essential data and making it free for anyone to use, share, and build on (Source: https://okfn.org/about/, retrieved 26.04.2015).

85   The P2P Foundation, also known as the Foundation for P2P Alternatives, has applied the peer-to-peer (P2P) model to investigate and reshape different fields, such as economics or politics. According to the P2P Foundation, the peer-to-peer model "is a new form of organizing and subjectivity, and an alternative for many systems within the current socio-econominic and cultural-political order." The Foundation explicitly acknowledges that the influence of the Open Source movement "provides for models that could be used in other areas of social and productive life" (Source: http://p2pfoundation.net/P2P_Foundation:About, retrieved 26.04.2015).

microcontributions, *voice* that originates in small-scale communities can be heard across the different political levels proposed by Couldry, from the community itself to organizations active on a global stage, and seek visibility and legitimacy in different, non-immediate social and political scopes. The ERV Methodology seeks precisely to harness the Internet's potential for amplifying the *voices* of small groups of people. As I will argue in chapter 5, even if the purposes of such groups are not explicitly political, the mere action of allowing excluded voices (such as those of small-scale farmers) to be heard across political scales may be regarded, in itself, as a political act.

2.2.5.2. Digital Media Art.

Digital media art[86] is, together with various social movements, a field of theory and practice in which information and communications technologies have been critically transformed. In contrast with the commonly held view that art exists separately from the world that it merely represents, it may be argued that art can become an agent in its transformation. As philosopher Timothy Morton suggested, art does not simply create representations of the world, but it actually operates within its causal relations, modifying them (Morton, 2012). Rather than being a mere decoration, "art becomes a workshop of experimentation in and on actually existing causes and effects," since it "tampers directly with causality" (Morton, 2012, pp. 205, 216). Following this perspective, it may be argued that artistic works may directly intervene and transform their contexts in a complex, yet actual way. Therefore, digital media art may be viewed as a field that holds a significant potential for the transformation of the technologies it is involved with, as it exists and operates within their framework. Moreover, by focusing on processes rather than on finished objects,[87] works of digital media art may also be regarded as sorts of workshops in

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86 Rather than defining what digital media art *is*, several authors have attempted to identify its most salient characteristics, often in relation with preceding art forms. Notably, Lev Manovich argued that computers enabled the translation of all existing media into numerical data, resulting in the computability of graphics, moving images, sounds, shapes, spaces, and texts (Manovich, 2001). The combination of this transformation to numerical formats with the capacities of computers for processing and calculus have endowed digital media art with specific characteristics, such as nonlinearity, multimediality, or hypertextuality (Golumbia, 2014).

87 Artist and theoretician Roy Ascott has argued that art, and, perhaps more intensively, digital media art, may be understood as a process in which the roles of artist, object, and audience can be dramatically redefined, and where meanings are the product of interaction and, consequently, are always negotiated (Ascott, 2003). Following Ascott's views, digital media art resides "in a cultural communications system rather than in the art object as a fixed semantic configuration" (Ascott, Shanken, 1990).

which the very materiality of technologies, particularly information and communications technologies, may be subjected to conscious and intense transformations.

Even though digital media art is not necessarily political, at least in an explicit way, a significant number of works produced within that field resonate with the political models and possibilities that the architectures of information and communications technologies specifically provide.[88] For instance, the Critical Engineering Manifesto,[89] co-written by artists Julian Oliver, Gordan Savičić, and Danja Vasiliev, explicitly recognizes the role of the digital media artist as being very close to that of the engineer who shapes and transforms digital technologies. Referring to the artist as a "Critical Engineer" who transforms software and hardware, the Manifesto states that "the Critical Engineer notes that written code expands into social and psychological realms, regulating behavior between people and the machines they interact with. By understanding this, the Critical Engineer seeks to reconstruct user-constraints and social action through means of digital *excavation*." The works of Oliver, Savičić and Vasiliev are coherent with their manifesto, which holds a strong suggestive potential that may inspire other artists.[90]

Politically explicit works of digital media art have often been labeled as *Tactical Media*: a term used to describe art practices that critique and oppose the hegemonic political and economic orders by using the same technologies that make them possible (Garcia, Lovink, 1997; Kluitenberg, 2011). The works of artist collectives such as the Critical Art Ensemble,[91] Electronic Disturbance Theater,[92] 0100101110101101.ORG,[93] or Ubermorgen[94] are commonly referred to as *Tactical Media*. However, the increasing integration of information and communications

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88 It must be noted that *Internet Art*, or art that uses the Internet as a medium, may be identified as a category within digital media art (Simanowski, 2014). In the case of *Internet Art*, the political model offered by the architecture of the Internet becomes its immediate political context and therefore its potential model.

89 https://criticalengineering.org/ (retrieved 27.07.2015)

90 For example, the work *Transparency Grenade*, by Julian Oliver, consists of an electronic device engineered by the artist himself, capable of leaking and mining information extracted from WiFi connections. The device operates not only within a technical framework but also an explicitly political one that deals with what the author considers as a "lack of corporate and governmental transparency." The description of *Transparency Grenade* may be accessed at http://transparencygrenade.com/ (retrieved 27.07.2015).

91 http://www.critical-art.net/ (retrieved 24.07.2015)

92 http://www.thing.net/~rdom/ecd/EDTECD.html (retrieved 24.07.2015)

93 http://0100101110101101.org/ (retrieved 24.07.2015)

94 http://www.ubermorgen.com/UM/index.html (retrieved 24.07.2015)

technologies and the concreteness of everyday life has caused political struggles, and therefore *Tactical Media* itself, to go beyond their original form of agency. *Tactical Media* was originally concerned with critiquing power within the sphere of digital networks and technologies. Yet their pervasiveness has introduced necessary shifts that have forced such forms of critique and struggle to expand their field of action into more concrete contexts. The blurring of the division between the digital and the physical has allowed media tactics to cross the borderline between the virtual and the concrete, the global and the local (Hands, 2014; Terranova, 2004).

Consequently, as an attempt to incorporate these observations and update the category of *Tactical Media*, media theorists Ned Rossiter and Geert Lovink proposed an alternative one, called *organized networks*. Rossiter critiqued the *tactics* in *Tactical Media* by arguing that they mimicked the ephemeral and disruptive logic of contemporary capitalism (Rossiter, 2006). As an alternative, the concept of *organized networks* was proposed. *Organized networks* consist of small-scale coalitions whose strong bonds emerge out of peer-to-peer encounters, and whose aim is to cooperate in order to realize projects and produce cultural artifacts (Lovink, 2011). According to Lovink, *organized networks* are forms of collaboration that arise after the processes of digitization and informatization have reached completion (Lovink, 2011). Such forms seek to transcend the strictly technological scope of *Tactical Media* and attain long-term, cultural transformation*,* but without abandoning the task of critically transforming information and communications technologies (Lovink, 2011; Lovink, Rossiter, 2014). Moreover, *organized networks* are to be considered as new institutional forms that greatly differ from those existing in representative democracy, as they strive to achieve non-representational democratic models of decision-making.

According to Lovink and Rossiter, "there is no universal formula for how an organized network might invent its conditions of existence," since "its institutional logic is internal to the sociotechnical dimensions" within which it exists (Lovink, Rossiter, 2005). Consequently, it is impossible to present a paradigmatic model or example that may illustrate the concept. Yet, despite the openness with which the concept was defined, the authors claimed that *organized networks* offered a

substantial potential as non-representative institutions for the collaborative production of knowledge (Lovink, Rossiter, 2005).

Significantly for this dissertation, digital media art has strongly focused on the possibilities for reciprocal collaboration that information and communications technologies enable (Golumbia, 2014, Brough, 2014). An outstanding example of artistic collaboration mediated by digital networks may be found by looking at the term DIWO (Do-It-With-Others), coined by the British collective Furtherfield.[95] DIWO is used to describe a set of practices that use the Internet as an experimental artistic medium and distribution system to foment collaborative, grass-roots creativity (Catlow, Garrett, 2012). According to the proponents of the term, these practices apply the metaphors, tools, cultures, and processes of digital networks to artistic experimentation that involves diverse participants and ideas (Catlow, Garrett, 2012).

I posit that the possibilities for collaborative practice offered by digital networks, together with the political awareness that permeates the field, may turn digital media art into a fruitful framework from which to strengthen *reciprocal voice* through the usage of technologies. As discussed in the introduction of this dissertation, the ERV Methodology was derived from my experiences with the Megafone project, which was carried out within the context of digital media art. However, as I will argue, the methodology seeks to transcend that context in order to activate processes of *cross-community research* that involve small-scale farmers, scientists, and other actors.

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95 Furtherfield: http://furtherfield.org/ (retrieved 04.08.2015)

2.2.5. Mobility.[96]

Mobile phones offer unprecedented possibilities for amplifying *voice,* and their analysis may reveal important insights on how values are embedded in technological artifacts and networks. Mobile phones were originally designed to allow people to communicate using voice and short texts, independently from their physical location. However, the range of functions they can perform has been so vastly extended and redefined that it is important to study them not as mere *phones*, but as mobile, connected computers. Despite their technical capability to maintain voice and data transmission while moving between antennas, Castells argued that the key feature of mobile communications is not mobility, but perpetual connectivity (Castells, 2009). Yet such perpetual connectivity is not without risks. As media theorist Doglas Rushkoff pointed out, digital technologies are oblivious to human time: email or SMS messages are received by our devices with complete disregard to the rhythms, cycles, and continuity on which humans depend for coherence (Rushkoff, 2010). Therefore, because of the perpetual connectivity enabled by mobile phones, the arrhythmic proliferation of *voice* may negatively affect its value. It has been argued that this communicative proliferation may open the path towards a cognitive surplus, in which *voices* collectively generate more available content than what may possibly be consumed (Shirky, 2010). However, the potentially positive effects of cognitive surplus may be attenuated or even negated by a scarcity of attention: as content grows increasingly abundant, attention becomes a limited commodity that must be managed and exploited efficiently (Davenport, Beck, 2001).

Mobile phones enable a new paradigm of *always on*, mass self-communication. According to Castells, this paradigm involves mass communication because anyone can potentially reach a global audience and, at the same time, it

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96 In 2013 there were almost as many mobile phone subscriptions as people in the world (ITU, 2013). The global mobile penetration rate stands at 96%, with 128% in developed countries and 89% in developing countries. These rates strongly contrast with the global percentage of people connected to the Internet, which reached 39% on that same year (ITU, 2013). Originally, mobile phones operated using analog radio communications. However, mobile digital communication was introduced in the early 1990s, when cellular technology was launched under the Global System for Mobile Communications (GSM) standard. The GSM standard was initially adopted as a set of protocols that allowed full duplex voice communication and Short Message Service (SMS), and was soon expanded to include data communications. Presently, a number of packet-switching protocols similar to TCP/IP operate on GSM, making the convergence between mobile networks and the Internet possible. Access to the Internet on mobile phones, known as mobile broadband, has climbed from 268 million subscribers in 2007 to 2.1 billion in 2013. The annual growth rate of 40% makes mobile broadband the most dynamic telecommunications market (ITU, 2013).

involves self-communication: "The production of the message is self-generated, the definition of potential receiver(s) is self-directed, and the retrieval of specific messages or content from the World Wide Web and electronic communications networks is self-selected" (Castells, 2009, p.55). I posit that *always on*, mass self-communication channeled through mobile networks manifests the essentially individualist status of citizens under the self-interested, competitive, and consumerist model of neoliberalism. Mobile phones represent a lifestyle in which people are expected to be permanently connected and available, often for the sake of competitiveness and efficiency, and at the same time highly independent and mobile.[97] In such a lifestyle, self-centered, accelerated communication proliferates, while the value of *voice*, as defined in chapter 1, becomes eroded and devalued precisely thanks to the individualization, acceleration, and proliferation that *voice* is subjected to.

Mobile phones embody a radical individualization of human communication. The very physical construction of the hand-held, battery-powered devices makes them mobile companions to be stored in peoples' pockets or handbags. Moreover, their interfaces, which have evolved from a combination of simple monochrome screens and keypads to touchscreens, are largely designed with the individual user in mind. Consequently, the mode of usage induced by mobile phones prevents the communal sharing of the devices. This represents an important shift in the social history of telecommunications, given the fact that the mobile phone's predecessor, the fixed or *landline* phone, was commonly shared by the people in common spaces such as households or offices or, as the *casetas* in Tlahui demonstrate, entire communities.

Thus, I posit that mobile phones may reveal the extent to which the core values of neoliberalism, competition, and individual self-interest, have become embodied and instrumentalized in information and communications technology. Moreover, the massive, global adoption of mobile phones as the preeminent

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97 The mass-self communication afforded by mobile phones is coherent with the ubiquitous injunction of neoliberalism, and its internalization by subjects, of "maximization of performance (production) and enjoyment (consumption)" (Rouvroy, 2012, p.8). Through such injunction, neoliberalism produces a normative horizon for subjects, in which "becoming themselves," "self-control," "self-entrepreneurship," and "self-evaluation" become continuously reiterated projects (Rouvroy, 2012, p.8).

technology for communication suggests that their usage might prompt the adoption of these values in all sorts of cultural contexts. However, I also suggest that *always on* mass self-communication is not confined to *one-dimensional* individual behavior, nor strictly destined to impose itself unproblematically in every corner of the planet.[98] As I have argued, the transformation of technology consistently presents itself as an opportunity for political agency. Mobile phones, in fact, are being increasingly adopted by many grassroot and activist movements, as they may provide a bridge between digitally assisted organization and communication and physical actions (Castells, 2001; Castells, 2009; Hands, 2011; Rheingold, 2002).

In his influential book, *Smart Mobs*, cultural critic Howard Rheingold described how the organization and tactics of social movements were increasingly influenced by the usage of mobile phones. Rheingold observed the capacity of mobile communications to summon large, uncoordinated crowds, or *smart mobs*, and engage them in situated political demonstrations (Rheingold, 2002). He explained that smart mobs emerged from the aggregation of individual decisions and were characterized by their autonomy, connectivity, and lack of centralized control (Rheingold, 2002). However, the notion of smart mobs may be questioned precisely by pointing out that it unproblematically reduces deliberation and conflict to the simple emergence of a self-regulated collective will (Hands, 2011). The complex political outcomes which resulted from the massive mobilizations of the Arab Spring, which originated with the physical gatherings of smart mobs in different countries, may illustrate this point[99].

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98 In her critique of information and communications technologies, Jodi Dean suggested that "the problem is not that the extremes of a contemporary capitalism that has merged with the most fundamental components of communicativity" is forcing us to "preserve and protect our individualities" from pathologies such as "depression, anxiety, autism, and hyperactivity" (Dean, 2013, p.186). Rather, those pathologies signal the breakdown of individualism, which, according to Dean, might be considered as a pathological form in itself (Dean, 2013). Such a view implies that the model of individual, mass self-communication may indeed be questioned and resisted without necessarily rejecting information and communications technologies. Following Dean, what might be rejected is not technology, but rather its embedded values.

99 Joss Hands suggested that the fundamental importance of concrete space in political agency had become clear in the wake of the Arab Spring (2011) by arguing that the occupation of Tahrir Square in Cairo, Egypt, and the subsequent occupation movements around the world signaled the importance of the production of space in political struggle (Hands, 2014). Thus, movements such as the Arab Spring or Occupy relied not only on the communicational and organizational capabilities of digital technologies, as several authors and media outlets fervently announced (see, for example, "Spring Awakening: How an Egyptian Revolution Began on Facebook" http://www.nytimes.com/2012/02/19/books/review/how-an-egyptian-revolution-began-on-facebook.html?_r=0 , retrieved 27.07.2015), but also, and perhaps more significantly, on the presence and actions of people in concrete space.

Because of the reduction of the richness of *voice* to a mere epiphenomenon arising from the massive social interactions of individual agents, the notion of *smart mobs* tends to favor a homogeneous view of society, where massive organization tends to blur or eliminate the possibility of nuanced or bold decision-making (Hands, 2011). Although Rheingold was impressed by the numeric strength and the apparent *collective intelligence* of smart mobs, he might have overlooked the processes of social organization that happen before, during, and after their formation, as well as the concrete space where such processes occur.

Moreover, while social change on a massive scale, symbolized historically by revolutionary movements, may still be a crucial feature of the imagination of social movements, in this dissertation I argue for the importance of transforming and using technology to induce change on a small scale. Perhaps the goal of encouraging *reciprocal voice* is not entirely compatible with the sort of large-scale shifts that the gathering of *smart mobs* might bring but rather needs to be fostered within small groups. And, while it might seem counter-intuitive to harness the power of digital networks within such a limited scope, further on I will attempt to discuss the reasons why the ERV Methodology seeks to apply mobile phones and the Internet to induce the reciprocal exchange of *voice* precisely at such a small scale.

2.3. Conclusions.

In this chapter I have argued that the prevailing forms of technological determinism have deep historical roots. Technological determinism has contributed to a widespread perception of technological artifacts as autonomous, neutral, and context-free. This perception has prevailed with the successive reincarnations of technological determinism, *cyberlibertarianism* and *solutionism,* both of which share the same core value: that technology is the *prime mover* of social progress. Nevertheless, it may be possible to understand technology as a cultural construct open to political intervention. I have argued that technologies should be constantly questioned, reshaped, and contextualized, particularly information and communications technologies, which are currently at the center of deterministic discussions and acute political conflict.

The defense of radical individualism has been a recurrent argument against technological determinism and technocracy, which often appear cloaked behind a communitarian, left-leaning rhetoric. However, this defense may no longer stand if technologies are expected to play a role in the creation of alternatives to the hegemonic rationalities of neoliberalism that sustain individualistic self-interest as one of its core values. Therefore, I posit that, in order to reclaim technologies away from these values, it might be necessary to reinscribe them with a *reciprocal rationality* that may pose an alternative to economic and deterministic rationalities.

I have argued that using technologies to encourage and strengthen *reciprocal voice* may entail an act of sociotechnical transformation. Feenberg argued that the transformation of sociotechnical systems is a form of *tactical* resistance against technocracy, in which technologies tend to trump human communication (Feenberg, 1999). Thus, the transformation of sociotechnical systems can become an important part of emancipatory political movements, and may become the basis for the creation of a *reciprocal rationality*. If a *rationality* is understood as a pervasive mode of thinking embedded into *voice* and agency, then a *reciprocal rationality* has the potential to permeate our everyday behavior. Whereas neoliberal rationalities compel us to think, speak, and act in terms of economic benefit and technological automatisms, a *reciprocal rationality* might encourage us to do so in terms of giving, receiving, and returning (or speaking, listening, and replying) in a mindful and respectful way. In this research the aim is to design a methodology within the sphere of socitechnical transformation with the purpose of countering *voice*-devaluing rationalities. The ERV methodology seeks to take advantage of the interpretative flexibility offered by information and communications technologies precisely in order to achieve this purpose.

Information and communications technologies might be fostering what Jodi Dean called a *communicative capitalism*, in which merely rhetorical participation substitutes and undermines political engagement and agency. Yet, social movements and artists have attempted to resist the co-opting of those technologies by hegemonic powers through their critical transformation. In this respect, it may be observed that

social movements and digital media art inform each other reciprocally, often by interweaving their respective forms of theory and praxis. Consequently, in this research, I have attempted to adopt strategies from both fields. In particular, I have followed the principles of the *open source* movement in the programming of the software used in the ERV Methodology, as well as the theoretical guidelines of *organized networks*: formation of small-scale groups, peer-to-peer encounters, collaboration, long-term vision, and technological transformation. I will further argue that the ERV Methodology, in its intention of using information and communications technologies to encourage a reciprocal communicative praxis in small-scale farming communities, resonates with the principles and pursuits of the *organized networks*, while seeking to remain aware of the importance of concrete space in political organization.

Chapter 3: The Relevance of *Reciprocal Voice* in Agriculture.

Introduction.

So far, I have analyzed the social and political relevance of *voice* and reciprocity, and how these values may be strengthened by a transformative usage of information and communications technologies. In this chapter, I will apply this analysis as a theoretical lens with which to examine agriculture. The backdrop of this chapter consists of the social and ecological threats that endanger humanity, to which modern agriculture, as will be explained, has significantly contributed. The anthropogenic alteration of the planetary climatic system forces a radical reframing of contemporary forms of political and economic organization, as well as technological development. The broadness and complexity of this issue is beyond the scope of this dissertation; nevertheless, I will attempt to convey the necessity of finding alternative, more sustainable and resilient models for agricultural systems, in face of the magnitude of the combined effects of contemporary models of food production and climate change. I will do so under the assumption that agriculture is both increasingly subsumed by the economic mandates of neoliberalism, and threatened by anthropogenic climate instability.

The main question of this chapter is double-sided, and may be expressed by the following pair of statements:

1. Large-scale, industrialized agriculture is increasingly driven by technification and subjected to the mandates of global markets and economies of scale. This process has silenced the *voices* and marginalized the reciprocal practices of small-scale farmers and their communities.

2. Reciprocal forms of organization and exchange that still persist in diverse manifestations within communities of small-scale farmers may well hold one of the keys to sustainable agricultural systems demanded by global social, economic, and

climatic challenges.

In order to support the first part of the question, I will examine agriculture since the rise of its industrialization, with the aim of determining how it progressively became subjected to economic and technological rationalities. It may be possible to argue that the original network of reciprocal relations among agriculture, technology, culture, and economic exchange became progressively reduced to the subjection of farming to a technology-driven race for productivity and profit. Philosopher Michel Serres argued that humans have become a tectonic force with an unprecedented ability to transform ecosystems (Serres, 2004). Nevertheless, such human force has lost its capacity for long-term thinking and thus it exercises its transformative powers almost exclusively under the mandate of rapid economic growth. In face of the catastrophic outcomes of this capitalist *creative destruction*,[100] Serres called for a *natural contract* guided by a symbiosis between humans and natural ecosystems (Serres, 2004). In this chapter, I will suggest that such a symbiosis might also be understood as a form of reciprocity that extends beyond the social scope to include the relation between humans and ecosystems. However, I will focus on how the modernization of agriculture has tended to deny the *voices* and reciprocal values of communities of small-scale farmers.

I will address the second part of the question by studying the relation between prevailing forms of reciprocity in communities of small-scale farmers, particularly in the countries where the cases studies of this dissertation were carried out: Tanzania and Mexico. I will attempt to frame those forms within the field of agroecology and will examine their importance for the livelihoods of small-scale farmers, especially in times of global challenges. Is it possible to consider reciprocity in agriculture as a social and natural *contract* that may contribute to restoring ecological equilibrium while maintaining sufficient levels of food production? How can such reciprocal forms of relation be inserted into contemporary agricultural practices? I will address

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100 The notion of *creative destruction* in capitalism was introduced by economist Joseph Schumpeter, referring to the process by which capitalism needs to undermine and ultimately destroy its own economic foundations in order to advance. Thus, Schumpeter argued that the forces that sustained economic growth were necessarily disruptive (Schumpeter, 2008). In this chapter I will attempt to analyze how the disruptive practices of capitalism, particularly in its neoliberal turn, rely not only on the reiterated destruction of economic and material resources, but also on cultural *commons* shared in diverse social contexts based on subsistence farming in different parts of the world.

these questions in the final sections of this chapter.

3.1. The rise of large-scale, industrial agriculture.

Agriculture may have been the original motivation for human groups to enact large-scale changes in their natural environment.[101] However, before the advent of industrial agriculture in Europe (and elsewhere through different processes of dissemination, such as colonization), the development of agriculture perhaps can be described as a gradual process of *coevolution* with sociotechnical systems. The notion of *coevolution*, which originated in the context of biological sciences (Janzen, 1979), may be used to describe how two or more processes reciprocally affect each other's evolution. In the case of agriculture and its relation with sociotechnical systems, *coevolution* may perhaps contribute to understand processes in terms of reciprocity rather than causal relations. In Appendix E, I briefly describe how agriculture, since its origins, may have historically *coevolved* with sociotechnical systems. And, in the following paragraphs, I will attempt to describe how this reciprocal process became disrupted with the rise of capitalism and industrialization.

By the Late Middle Ages in Europe, most technical developments in agriculture, such as ley farming,[102] were achieved by farmers (Vasey, 1992). However, an important shift took place in the 17th century, when the scientific study of nature began to emphasize control over imitation or mutualism. This shift entailed the disruption of farmer-led technical innovation and was accompanied by important economic and political processes that originated in England. The centralization of the English state, which entailed the elimination of feudalism and gave more autonomous powers to noblemen, had material foundations rooted in agriculture. Land became increasingly concentrated in the hands of a few landowners, and these large portions of land were not worked by independent farmers but by tenants, who were subjected to economic rents (Meiksins, 1998). Thus, English farmers, who previously owned their means of production, were dispossessed of their lands. A

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101 Archaeological evidence suggests that humans have transformed ecosystems through the development of agricultural techniques, such as the irrigation systems in the banks of the lower Nile, for six millennia, at least (White, 1994).

102 Ley farming is a cropping system in which cereals are rotated with legume or grass pastures to improve soil fertility and disrupt pest or disease cycles.

process of *enclosure* soon followed. *Enclosure* went beyond the mere fencing of land and meant the extinction of common and customary usage rights on which many people depended for their livelihood (Meiksins, 1998). At the same time, increasing pressure was put on tenants to enhance their productivity in order to respond to market imperatives, causing an intensification of exploitation, both of natural resources and labor. Indeed, the origins of capitalism can be found in these converging processes of centralization, privatization, dispossession, intensification of productivity, and exploitation (Meiksins, 1998). And, even though these transformations were particular to England, they eventually spread across Europe and, through colonization, to other parts of the world.[103]

The *enclosure* movement in Europe may be understood as a capitalist appropriation of the *commons*, a process described in chapter 1. By enclosing the *commons*, reciprocal norms in agriculture were replaced by individual ownership, and land was subjected to exploitative use for the sake of profit. Economic historian Karl Polanyi described enclosures as "the revolution of the rich against the poor," and these were often executed through violence and coercion (Polanyi, 1996, p. 35). In his seminal writings, Adam Smith praised the efficiency of rationalized labor in factories,[104] but he neglected to mention that workers were often farmers who had been violently evicted from their homesteads (Smith, 2001). It may be argued that a concurrent effect of the submission of farmers to dispossessed labor was the devaluation of their *voice*, and thus of their political agency. The collective *voice* of farmers, which was essential in the organization and management of the agricultural commons prior to its *enclosure*, was silenced and fragmented as the self-interested individualism of economic markets took hold.

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103 Between the 1880s and 1919, Tanzania was part of German East Africa. In 1919, after the end of World War I, Tanzania came under British administration (Coulson, 2013). As a colony, Tanzania became a source of slave labor and raw materials to fuel the industrial revolution that was taking place in Europe. The colonial history of Mexico is somewhat different. Between 1550 and 1810, Mexico was a colony of Spain, a country where political unrest largely prevented the establishment of the industrial revolution (Knight, 2002). Thus, the transformations that would later give rise to large-scale, industrial agriculture in Mexico took place after its independence, under the dictatorial regime of Porfirio Díaz, between 1876 and 1910 (Dirk, 1982).

104 Despite Adam Smith's praise for the industrialization of labor, his theories were inspired by the idea that only agricultural activity produced real wealth, and that merchants or industrial manufacturers did not (Buchholz, 1999). Consequently, Smith argued against state protectionism for agriculture, claiming that it discouraged landowners from investing in technologies that increased the productivity of their lands. Economist David Ricardo agreed with Smith and, in 1815, developed his theory on rent based on agricultural models (Henderson, 1993). The theories of Smith and Ricardo had a strong influence on later developments in economics and contributed to consolidate commodified agriculture as an important trait of mainstream economics theory.

The *voices* of farmers may have been silenced further when experimental science was applied to agriculture and traditional knowledge was displaced by the knowledge and techniques of experts. The entry of experimental science in agriculture was driven by the preoccupation of landlords and tenants to improve the productivity of their lands (Meiksins, 1998). However, even though farm productivity did grow significantly in the eve of industrial agriculture, it was mostly thanks to farmers' innovation and knowledge of how to manage inputs such as seeds, fodder, and manure (Vasey, 1992). Even as farmers were dispossessed and exploited, developments in agriculture continued to be tied to farmer-led technical innovation well into the twentieth century, when a cascade of scientific and technological developments finally made the full industrialization of agriculture possible.

Early in the twentieth century, scientists were already developing chemical fertilizers, insecticides, and fungicides, as well as scientifically breeding high yielding crop varieties (Vasey, 1992). The introduction of modern science and technology in agriculture slowly imposed a rationalist, uniform approach that tended to minimize the importance of contextual complexity and variability (Dahlberg, 1990). Thus, it can be argued that the original *coevolutionary* processes in agriculture were disrupted because of the reductionism and "universalistic lenses" (Dahlberg, 1990 p. 84) of technological determinism.

3.2. The cultural impacts of industrial agriculture.

During the so-called third industrial revolution in developed countries (1940s through 1970s), electricity was finally taken to rural areas, the use of petrochemical pesticides such as DDT became widespread, and the adoption of mechanical harvesters and tractors powered by fossil fuels grew impressively (Vasey, 1992; Roberts, 2008). But the turn to industrial agriculture was not only a question of introducing sophisticated technology into the process: it was also, and perhaps more significantly, a cultural transformation. In World War II, figures of speech inspired by military language, such as *the war on hunger* or *the battle against poverty* became widespread, altering the way in which entire populations thought about food

and agriculture (Roberts, 2008). The well-being of civilian populations, for example, was understood by Claude Wickard, the US Secretary of Agriculture between 1940 and 1945, as a matter of "keeping morale high" (Roberts, 2008, p.32). By associating *morale* with the body-building properties of protein foods, Wickard directed farmers to switch from cereals and encouraged them to produce more meat and dairy products (Roberts, 2008). According to food policy analyst Wayne Roberts, "today's global food system was created in the last months of World War II as part of a vision to create a new world of abundance and peace" (Roberts, 2008, p.31). Roberts identified eight different ways in which agriculture and food production and consumption were deeply transformed (Roberts, 2008):

1. How food was produced: agriculture became a matter of scientific and technological production, closer to assembly lines in factories than to a rich and diverse activity.

2. Who produced food: in industrial agriculture, farmers were largely replaced by anonymous members of the global labor market.

3. Where food was produced: low transportation and energy costs became a powerful incentive to increase global trade in agricultural products. Thus, it became increasingly common to find that even local staple foods were produced in far away countries.

4. How food was processed before being sold: food became a product marketed in plastic bags, boxes, and cans and was mixed with preservatives and other ingredients in order to increase its shelf life or make its taste or appearance more desirable.

5. Where consumers brought food: local stores and farmers' markets were replaced by supermarkets, which offered abundance, convenience, and cheap prices.

6. How food was prepared: packaged food was marketed as ready to heat and eat, and thus allowing consumers to cut preparation time and effortlessly vary their

daily menus.

7. Where food was eaten: the convenient packaging and immediacy offered by industrialized food products allowed people to move away from the kitchen to the TV room, and from homes to cars, streets, or restaurants.

8. How food is eaten: prepackaged food prompted many people to eat quickly and on-the-go.

In the name of *abundance* and *peace*, these changes deeply affected a full range of processes that had gradually developed since prehistoric times. The way in which humans relate to nature in order to feed themselves was strongly constrained by market imperatives since the 17th century. However, the subjection of food production to economic rationality and technological determinism reached its peak with industrial agriculture. Following the main premise of this chapter, I claim that industrialized agricultural systems have, in turn, denied and eroded deeply-held communal values such as the oral transmission of traditional knowledge and reciprocal forms of organization and exchange. By subjecting agriculture to technological development for the sake of efficiency, industrialization reflected a certain disregard for the graduality and complexity of ecological and social processes. Whereas the methodologies of observation and experimentation had been crucial elements in the development of agricultural knowledge since ancient times, standardized technological fixes aimed at increasing production (both in quantity and speed) tended to be increasingly applied in the industrial age. The informal knowledge held by farmers, closely related to the origins and symbolic richness of cultures, was often replaced by the knowledge of experts and technical training, which attempted to reduce agriculture to a set of procedures executed by specialized workers and, increasingly, machines. Even though the impacts of cultural changes brought by an industrialized food system were felt more strongly and had wider consequences in rich countries, their influence, disseminated through colonialism, trade, mass media, and development programs, spread to poorer regions of the world. The industrialization of food rapidly became a model to which every country had to adapt, regardless of cultural, economic, or environmental specificities. But

how did industrialization affect the countries where the case studies of this dissertation were carried out?

3.3. The Green Revolution in Mexico.

The export of the model of industrial agriculture entailed the imposition of institutions, technologies, and infrastructures upon less developed countries (Dahlberg, 1990). This imposition was based on the assumption that the cultures and institutions of less developed countries were inferior and thus had to be developed in order to fit more rational and efficient models (Dahlberg, 1990). The model of colonialism, in which plantations[105] were created, often by expropriating land and displacing local subsistence farmers, was a precursor of the industrialization of agriculture in developing countries. This process may be exemplified by the Green Revolution, a strategy led by the United States since the 1940s, aimed at bringing high-input, high-yield agriculture to developing countries. The US had several reasons to promote the Green Revolution: solving hunger problems that caused mass unrest—thus documenting the superiority of its production methods over Soviet ones —and capitalizing on sales of industrial farm inputs such as tractors or fertilizers (Roberts, 2008). These reasons reveal that the Green Revolution might have used the mask of technological determinism to advance political and economic agendas that, at that time, seemed to be more important than increasing food production. Increased productivity was consistently presented as a humane and effective way to solve the problem of hunger and scarcity of land in the developing world and was presented as an argument against the practices of small-scale farmers, who were believed to be too bound to traditional (and, thus, supposedly inefficient) agriculture to effectively produce food (Ross, 1998). However, these assumptions, which sidestepped questions of self-sufficiency, the unequal distribution of food, and the lack of access to it, went largely unexamined and thus may have served to conceal the political and economic interests of the Green Revolution (Dahlberg, 1990; Ross, 1998).

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105 Plantations commonly occupied vast expanses of land and were dedicated exclusively to the extraction of wealth through the cultivation of cash crops and slave labor.

In Mexico, the birthplace of the Green Revolution, US plant breeders funded by the Rockefeller Foundation focused on the development of improved, high-yield plant varieties (Sonnenfeld, 1992; Dahlberg, 1990). These improved seeds followed a model that allowed for high production as long as the necessary energy and capital resources remained cheap and easily available. This model was designed in the United States, where farmers were still able to cultivate large fields with a small and cheap labor force and the intensive usage of machinery; however, in Mexico, farmers practiced a labor-intensive agriculture and had limited access to resources and capital. Therefore, the improved seeds implicitly carried an agricultural model that was incompatible with the socioeconomic situation of Mexican farmers. Although security of food production should have been more important for the local population than achieving high yields, the Mexican government began to shift towards a model in which rural production would feed the increasing urbanization and industrialization of the country (Dahlberg, 1990; Esteva, 2007b). Between 1940 and 1980, Mexico underwent a radical transformation in which subsistence, mostly indigenous farmers were progressively displaced by large agricultural entrepreneurs and forced into salaried labor. The abandoned lands, which were often communally owned, were absorbed by large-scale commercial production and became a pool for cheap labor power (Assies, 2008). Fertilized land increased almost tenfold, including artificially created *enclaves*, specifically conceived for the massive cultivation of hybrid seeds (Esteva, 2007b). High production was considered by the government to be the key for the development of commercial agriculture (Esteva, 2007b). However, by the 1970s, the Mexican model had resulted in the stagnation of agricultural productivity, hunger, malnutrition, and social unrest (Esteva, 2007b). Social and environmental problems became intertwined, as the decontextualized technologies and productivity-driven models of the Green Revolution depleted soils of necessary micronutrients through the practice of monoculture,[106] thus reducing their fertility (Pimentel, Pimentel, 2007). Consequently, soil degradation created a progressive dependency on expensive chemical fertilizers and other inputs that pushed farmers farther into poverty. Yet, the Mexican government continued to favor industrialization, productivity, and unequal economic growth through its policies

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106 Monoculture is an agricultural practice in which a single crop is cultivated in large expanses of land during long consecutive periods. It is widely implemented in the context of industrial agriculture, as it artificially creates the conditions for the optimization of yields through technification and minimal labor (Glaeser, 2011).

(Esteva, 2007b). As I will explain further on, the small-scale farmers of Tlahui, where the second case study of this research took place, have largely resisted this process.

3.4. Post-colonialism in Tanzania.

The Green Revolution did not reach Tanzania directly. However, the country (called Tanganyika before the annexation of Zanzibar to the mainland in 1964) was also subjected to attempts at rationalizing and commodifying agriculture, despite a major lack of industrial infrastructure. In the 1940s, Britain saw Tanganyika as an unprofitable colony, with a mostly inaccessible population scattered across a vast land, preoccupied with subsistence activities and not actively engaged in world markets (Waters, 2007). After World War II, the British government implemented a massive project known as the Tanganyika Ground Nut Scheme, in which 6,000 hectares of bush would be cleared to produce peanuts to be exported to England. Because of the lack of a skilled labor force, emphasis was put on mechanization. However, in 1949, the project finally failed because, among other factors, the machines broke down in areas that did not have access to maintenance facilities (Waters, 2007). The Tanganyika Ground Nut scheme was a clear example of the decontextualized introduction of technology, characteristic of technological determinism, which blinds expert planners to realities found on the ground. The fact that the project was unsuccessful also in terms of building local skilled labor suggests that specialized, salaried labor was not seen by farmers as an incentive at that time (Waters, 2007).

Between 1970 and 1980, after Tanganyika became independent and was renamed the United Republic of Tanzania, the socialist *Ujamaa*[107] project mandated the relocation of 10 million farmers from their homesteads and placed them in rationally planned villages (Waters, 2007). Although the rationale was national development, the focus was rather the increase of agricultural production for world markets. Farmers often had to be forced into the planned villages through coercive

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107 *Ujamaa*, roughly translated as "Socialism" in Swahili, was the name under which the social and economic development policies formulated by Tanzanian president Julius Nyerere in 1967 were commonly known (Nyerere, 1977).

measures implemented by the army. However, President Julius Nyerere made *Ujamaa* internationally attractive by claiming that farmers would have the best of both worlds: their identity as farmers would remain intact, and they would enjoy the fruits of the world economy (Waters, 2007). Such propaganda turned Tanzania into Africa's largest recipient of foreign monetary aid. However, by the early 1980s, the cash crops produced under the *Ujamaa* project, especially coffee and tea, suffered from declines in world prices, and the government became economically dependent on donor support (Waters, 2007). Monetary aid flowed into Tanzania, as the country implemented the structural adjustment policies as prescribed by international institutions (Tripp, 2012). However, aid flow tended to disenfranchise the recipient population (Tripp, 2012; Moyo, 2009), and thus it may have been a factor that contributed to the devaluing of *voice* in the political scenario.

3.5. Agriculture under neoliberalism.

The neoliberal model began to spread to developing countries in the 1980s. Often burdened by huge monetary debts, these countries were coerced by institutions such as the World Bank or the International Monetary Fund into adopting neoliberal measures internally (Klein, 2007). As a consequence, neoliberalism has further weakened the political sphere in these countries, as public matters have tended to fall increasingly into the hands of global corporations (which are largely unaccountable to the public) rather than governments (Chomsky, 2004; Ziegler, 2002).

Neoliberalism is largely driven by financial markets, in which everything may potentially become a commodity subject to trade and speculation, including crops. During the Green Revolution, state-led agricultural development tended to pay farmers very low prices and supported large producers, pushing farmers into poverty and migration (De Schutter, 2014). Global trade policies later made low-income countries increasingly dependent on food imports. Under neoliberalism, global food markets became subject to deregulated financial speculation, with consequences including highly volatile prices and destabilized access to food. The vulnerability of low-income countries, aggravated by neoliberalism, became apparent in 2008, when prices of agricultural products suddenly increased largely due to speculation in global

markets and rising oil prices (Ramonet, 2010; Christiaensen, 2009). The 2008 food crisis resulted in political turmoil in several countries[108] and human suffering amidst the weak responses of governments, and revealed important flaws in the unregulated global food system, including a lack of focus on public goods and accountability, a policy-induced link between food and fuel prices, deregulated markets, and inefficient national social safety nets (Christiaensen, 2009). Because global food systems had been shaped to maximize efficiency and produce large volumes of commodities, they failed to consider just distribution and equal access to food (De Schutter, 2014). Despite the fact that the volume of food production was far larger than population growth between 1960 and 2000, access to food followed market-based criteria that effectively prevented an equitable distribution (De Schutter, 2014). Thus, subjecting food to neoliberal trade and commodification effectively resulted in globalized hunger, which had directly affected at least 12% of the world's population by 2013 (De Schutter, 2014).

3.5.1. The effects of neoliberal policies for agriculture in Mexico.

In Mexico, neoliberal policies for agriculture may be regarded as the deepening of the modernizing process laid out by the Green Revolution. Although the Green Revolution's large-scale industrial agriculture model, with its long supply chains and its top-down mode of knowledge transmission, did not result in greater food security,[109] the lesson was not learned (Rivera-Ferre, 2012). In 1994, Mexico, the US, and Canada signed the North American Free Trade Agreement (NAFTA), which prompted the full implementation of the neoliberal model in the participating countries and established a deregulated market based on the elimination of trade barriers and tariffs.[110] An immediate effect was the abundance of food products, especially imported ones, in supermarkets, which have been identified as one of the links between the population's diets and global markets. Because they regulate access

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108 For a study of the correlation between the 2008 food crisis and social unrest, see (Lagi et al., 2011).

109 According to the Food and Agriculture Organization (FAO), food security "exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

110 The relative vulnerability and inefficiency of Mexican agriculture, compared to US and Canadian agriculture, initially compelled the signatories of the NAFTA to establish a fifteen-year moratorium so that Mexico could improve its agricultural sector and make it more competitive. However, this transition period was subsequently compressed into 30 months, forcing Mexican farmers into rapid adjustment (Nadal, 2000).

to customers, supermarkets also play a fundamental role in fixing the prices of the entire food supply chain (Hawkes, 2006; Roberts, 2008). NAFTA regulations facilitated foreign investment in Mexico and stimulated the growth of multinational retailers. The result was an explosive growth of chain supermarkets, especially those related to US-based corporations such as Wal-Mart, which eventually became the country's leading retailer (Hawkes, 2006). These monopolies, with bulk purchasing power, thrived by offering cheap prices to consumers while tending to pass the economic burden down the production line to farmers (Roberts, 2008). These practices affected the ability of Mexican farmers to earn a living by commercializing agricultural products, and they were further weakened by the dumping[111] of agricultural products. Studies have shown that US agricultural subsidies after NAFTA have resulted in the dumping of cheap goods in Mexico, namely maize, and have generated huge economic losses for Mexican maize farmers (Wise, 2009). Although supporters of free-trade policies in agriculture tend to overlook the existing contradiction between deregulation and government subsidies, and argue that NAFTA has brought economic benefits such as lower prices for consumers,[112] the liberalization of agricultural trade has undoubtedly had negative impacts on small-scale farmers and their communities (Fiess, Lederman, 2004; Barkin, 2007; Fitting, 2006). The quantity of maize dumped into Mexico has greatly exceeded the needed amount, and its cheap price has pushed Mexican farmers out of the competition they were initially forced to enter (Barkin, 2007). Neoliberal reforms have granted an unfair advantage to global corporations and large-scale US farmers and thus contributed to an increase in migration towards the US throughout rural Mexico (Fitting, 2006). This scenario illustrates how neoliberal policies tend to disregard the livelihoods of farmers and their communities, and therefore their *voices* and reciprocal practices and values.

In much the same way that the Green Revolution introduced decontextualized technologies in Mexico and other countries, neoliberal policies have also tended to

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111 According to the World Trade Organization, dumping consists in price discrimination, where the exported product is sold at prices below its cost of production in the importing country (Source: http://www.wto.org/english/tratop_e/adp_e/adp_info_e.htm, retrieved 26.03.2014).

112 Even though food prices have become cheaper in Mexico, economic analysts often overlook the fact that quality has tended to degrade, often to the level of what is commonly known as "junk food." Junk food not only provides insufficient micronutrients, but also contributes significantly to obesity and other related health problems (Hawkes, 2006).

favor *deterministic technological solutions* to be applied regardless of the social and environmental context. While hybrid seeds may be considered the flagship technologies of the Green Revolution, biotechnology largely complements their role under neoliberalism.[113] The case of Genetically Modified (GM) maize is a clear example of this shift.[114] There is great controversy in the scientific community about the risks associated with GM maize (as well as other GM crops), including its ecological impacts, its effects on animal health, and the development of resistant varieties of pests and weeds (Benbrook, 2004; Craig et al., 2008; Meyer, 2011; Hilbeck et al., 2012). However, there is little doubt that the economic values embedded in GM technologies, namely the commodification of seeds and their protection by intellectual property rights, deeply affect the livelihoods and reciprocal practices of rural farming communities throughout the world (Fitting, 2006; Meyer, 2011; De Schutter, 2009). Biotechnological research and development led by corporations, together with the business model of GM and hybrid seeds, which forces farmers to continuously buy new seeds, may satisfy the needs of large-scale farmers in industrialized countries. However, it neglects small-scale farmers in poor countries by jeopardizing their seed systems, which are based on the sharing and saving of seeds and are a source of economic independence and resilience (De Schutter, 2009).

In Mexico, the introduction of GM maize seeds is a matter of heated debate. Research in 2001 reported that the DNA of GM maize was present in native maize grown in Oaxaca, probably because of unintentional transfer through pollen dispersion (Quist, Chapela, 2001). GM maize has met with a great social resistance, and different organizations have claimed that GM maize puts the very existence of small-scale farmer communities at risk by disrupting their reciprocal seed systems and forcing them into economic dependence on a technology whose efficacy has been deeply questioned (Red en Defensa del Maíz et al., 2012).

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113 In chapter 4, I will study how the neoliberal model for agriculture has also integrated the usage of information and communications technologies as key drivers of development in poor countries.

114 GM maize has two new properties achieved through biotechnological methods: resistance against herbicides and production of endotoxins that kill specific pests (Meyer, 2011). GM maize that produces endotoxins is known as BT (*Bacillus* thuringensis) maize. The genetic modification of BT maize entails the insertion of specific genes from the bacteria into the DNA of maize seeds. Although BT maize has been modified to express a specific protein, studies show that other features of the plant may also be affected (Saxena, Stotzky, 2001).

3.5.2. Introducing the Green Revolution in Tanzania.

The plans to introduce a Green Revolution in Africa are driven by costly inputs such as chemical fertilizers and GM technologies associated with seed patents (Tran, 2013). Tanzania is currently in transition towards a neoliberal regime, as briefly described in chapter 1. The push towards economic development has occurred in the context of an increasing industrialization along the interests of international donors, which was nonetheless regarded as "unimpressive" by the United Nations Industrial Development Organization (UNIDO et al., 2012, p.16). The fact that Tanzania has lagged behind regional role models in terms of the quantity and quality of industrialized goods, together with its low income levels, may explain why the country is not yet considered as an interesting market for global corporations (UNIDO et al., 2012). However, as philosopher Achille Mbembe has claimed, African governments have progressively surrendered their functions and tasks into private hands (Mbembe, 2011).

This phenomenon, which Mbembe called *indirect private government*, tends to dismantle the sphere of politics while encouraging privatization and may therefore silence the *voices* and limit the political agency of citizens. The actions and effects of *indirect private government* can already be observed in Tanzania, as global corporations become increasingly interested in offering different types of technological solutions to overcome hunger and poverty. In the context of agriculture, a notable example of such corporate interests is the Alliance for a Green Revolution in Africa (AGRA). Founded in 2006 through a partnership between the Rockefeller Foundation and the Bill and Melinda Gates Foundation, AGRA seeks to increase food security, reduce poverty, and introduce a Green Revolution in Africa, with Tanzania as one of the main focus countries.[115] Although AGRA includes public organizations in its network of partners, the presence of large and economically powerful corporations is strong. The economic and technological interests of one of the alliance's partners, the Rockefeller Foundation, whose role was decisive in the introduction of hybrid seeds during the Green Revolution in Mexico, may be identified in AGRA's main strategic objective: the development of "technologies to

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115 AGRA: http://www.agra.org/who-we-are/about-the-alliance/ (retrieved 27.03.2014)

rapidly increase agricultural productivity" (AGRA, 2012). Although the failures of the Green Revolution in Mexico have been widely recognized, commodification and technological determinism still seem to prevail in the *Green Revolution* label. Thus, the core values embedded in Green Revolutions remain unquestioned, while technologies and business models are replaced for supposedly improved ones, as if remedying past failures had been just a matter of developing new and improved technical and economic fixes. As argued, values related to economic and technological rationalities tend to devalue *voice* and reciprocity, reducing the scope of alternative forms of political agency through the induction of self-interested economic behaviors and closed, decontextualized technologies. Thus, it is possible to argue that, despite their apparently well-meaning goals for achieving economic growth, models such as those introduced through AGRA may ultimately push Tanzanian farmers into a deeper silence.

3.5.3. Questioning the notion of *revolution* in Agriculture.

I claim that one of the cultural factors that led agriculture into the grip of economic and technological rationalities may be found in the Western notion of *revolution*. A revolution is a sudden, momentous change that radically transforms a given state of things. Although the concept predates capitalism, it is closely related to its disruptive nature, as identified by economist Joseph Schumpeter (Schumpeter, 2008). Philosopher François Jullien claimed that the widely influential Western worldview tends to understand history in terms of revolutionary change and is therefore blinded to what he called *silent transformations* (Jullien, 2010a). Silent transformations are infinitely gradual processes that escape attention because of their very gradualness. Jullien contrasted the silent transformations that take place without generating shocks or resistance in the spheres of politics, economics, and culture with the "dramatization" of history when viewed as a sequence of revolutionary events (Jullien, 2010a, p. 82). In a similar vein, Mumford argued that the so-called "agricultural revolution" of the neolithic was not actually a sudden, drastic change, but the product of slow and complex transformations (Mumford, 2013). Accordingly, I suggest that the subsequent revolutions that directly or indirectly affected agriculture—the scientific and industrial revolutions, the *Green*

revolutions, and the current *mobile revolution*, discussed in chapter 4—may be understood as impositions of the cultural construct of sudden and radical change on processes that, instead, may naturally tend to be gradual and intricately interconnected to a wide diversity of factors. The widely held vision that agriculture may be transformed through an endless iteration of revolutions, each one more technically and economically developed than the previous one, might in fact be a plausible explanation for why modern agriculture has greatly disrupted social and ecological systems. Whereas Polanyi already identified such disruptive effects on the fabric of subsistence farming communities in the early stages of capitalism (Polanyi, 1996), the catastrophic effects of modern agricultural revolutions on ecosystems have only recently been understood. The notion of *revolution* that has driven the modernization of agriculture is at odds with reciprocal thought and practice and therefore also at odds with the development of a *commons*. As philosopher Bruno Latour put it, "a solid pragmatism, a limited confidence in human cunning, a sane respect for the powers of nature [and] a great care invested to protect the fragility of human enterprise" appear to be the virtues for the dealing with the world we live in (Latour, 2014).

3.5.4. The effects of neoliberal agriculture on *voice* and reciprocity.

From the perspective of this dissertation, the consequences of the subjection of agriculture to economic and technological rationalities might be listed as follows:

- The devaluing of *voice* and political agency of small-scale farmers, whose traditional social structures and reciprocal forms of organization and exchange have tended to become disrupted by large-scale, industrialized agriculture. Under technocracy, the *voices* of farmers effectively become silenced as their knowledge systems are deemed primitive and inefficient.

- Neoliberal values that guide global agricultural policies and trade rule out the possibility of a truly reciprocal agriculture. The reciprocal norms that are crucial for the maintenance of *commons* such as agricultural knowledge or natural resources are neglected for the sake of profit, self-interest, and economic rationality.

- The narrowness of technological determinism has prevented the implementation of *cross-community* strategies in agriculture: instead of implementing programs that take social and environmental contexts into account, decontextualized and quick, *solutionist* fixes are repeatedly imposed in a top-down fashion, at times with negative results.

These consequences, in turn, have led to the exacerbation of global problems such as food insecurity, poverty, hunger, social unrest, and environmental damage.[116] A report published by the United Nations Conference on Trade and Development (UNCTAD) titled "Wake up before It's Too Late" stated that the subjection of agriculture to global economic markets has resulted in poverty and hunger despite the fact the world production of calories is sufficient to feed a population of 12-14 billion (UNCTAD, 2013). The report found that the strategies recommended to developing countries of relying on international markets to meet staple food demands while specializing in the production of cash crops has failed because it assumed that staple food prices would remain low, thanks to a sufficient supply in international markets (UNCTAD, 2013). However, these conditions may no longer be taken for granted, as demonstrated by the 2008 food crisis.[117]

3.6. A paradigm shift: from productivity to *food sovereignty*.

The International Assessment of Agricultural Knowledge, Science, and

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116 According to the Intergovernmental Panel on Climate Change (IPCC), changes in the atmospheric abundance of greenhouse gases and in land surface properties are elements that alter the energy balance of the climate system. The report on climate change issued by the IPCC in 2007 identified industrial agriculture as one of the main contributors to the increase of carbon dioxide, methane, and nitrous oxide emissions (IPCC, 2007). A 2013 report issued by the World Resources Institute estimated that industrial agriculture contributed 13% of the global greenhouse gas emissions (WRI, 2013). Other estimates establish that the percentage might be much higher, between 44-57%, if additional factors such as food processing, packaging, and waste are taken into account (GRAIN, 2011). FAO estimates from 2014 show that emissions due to industrial agriculture, land use change, and deforestation have nearly doubled over the past 50 years, and could increase an additional 30% by 2050 if no efforts to reduce them are implemented (Tubiello et al., 2014).

117 Global policies such as the Millennium Development Goals postulate strategies for improving food security and reducing poverty in developing regions, including "broad-based and rapid agricultural productivity and economic growth to increase effective incomes, effective food demand, and food availability" (IFPRI, 2006, p. xi). On the other, it has been demonstrated that the behavior of the global food price index can not be accurately explained by supply and demand economics, but instead by models that include distortions induced by financial speculation (Lagi et al., 2012). Thus, the premise that poverty can be reduced by encouraging economic growth through the increase in global agricultural productivity may be questioned. How can agricultural productivity ensure food security and increased incomes if it is effectively decoupled from food prices? Such a decoupling can illustrate the notion that neoliberalism may not necessarily be concerned with establishing a rational economic order, but rather with securing the global hegemony of financial markets.

Technology for Development (IAASTD), exposed the unsustainability of neoliberal trends and called for fundamental changes (IAASTD, 2009a). The IAASTD report argued in favor of a fundamental shift in agricultural policies towards the acknowledgment of the multifunctionality of agriculture, understood as the interconnectedness and complexity of agricultural systems within diverse social and ecological contexts. The report identified a strong social element in food production, which included health, gender, tradition, social structures, and culture (IAASTD, 2009). Different initiatives and movements have also addressed the multifunctionality of agriculture by stressing its social components. The *right to food*, for example, is a notion[118] fostered by the United Nations (UN) that may only be achieved through a paradigm shift: from productivity to social and environmental sustainability (De Schutter, 2014).

Whereas the notion of the right to food may serve as a framework for global policy-making, a corresponding bottom-up approach may be found in the concept of *food sovereignty,*[119] introduced by *Vía Campesina*, an international movement of peasants, small- and medium-size farmers, landless people, indigenous people, and agricultural workers explicitly dedicated to stopping the destructive neoliberal process.

Small-scale farmer cooperatives and larger, transnational movements, such as *Vía Campesina*, are examples of how farmers collectively raise their *voices* in local and global political scenarios to defend their values, culture, and livelihoods. The actions of *Vía Campesina* are particularly interesting in the context of this dissertation, as they contribute to reinforce the political agency of small-scale farmers. The movement emerged during the 1980s and early 1990s from the coalition of autonomous rural farmer organizations, first in Latin America and then on a global scale (Martínez-Torres, Rosset, 2010). Since 2008, the movement has

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118 According to the UN, the right to food consists in "the right of every individual, alone or in community with others, to have physical and economic access at all times to sufficient, adequate, and culturally acceptable food that is produced and consumed sustainably, preserving access to food for future generations" (De Schutter, 2014).

119 According to *Vía Campesina*, "food sovereignty is the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems. It develops a model of small scale sustainable production benefiting communities and their environment. It puts the aspirations, needs, and livelihoods of those who produce, distribute, and consume food at the heart of food systems and policies rather than the demands of markets and corporations" (Source: http://viacampesina.org/en/index.php/organisation-mainmenu-44, retrieved 28.03.2014).

taken a clear position against transnational corporations and has identified the issue of gender as a critical one.[120] The people who form this movement come from different environments and cultures throughout the world and therefore may be regarded as a multitude who produce and defend the commons symbolized by *food sovereignty*. The concept of food sovereignty, brought to public debate by *Vía Campesina* during the world food summit in 1996, is an alternative model of food production. Food sovereignty argues that the production of food for local and national markets is more important than production for export. It advocates broad-based and inclusive local and national economic development, addresses poverty and hunger, and seeks to preserve rural livelihoods through the sustainable management of ecological resources (Martínez-Torres, Rosset, 2010). *Vía Campesina* recognized the political implications of food sovereignty by claiming that the concept underlines the need for "new social relations free of oppression and inequality between men and women, peoples, racial groups, social and economic classes, and generations." (Martínez-Torres, Rosset, 2014)

Moral values such as reciprocity, play a central role in the political strategies of *Vía Campesina*. Such strategies typically consist in occupying and defending political space by moving debate out of the merely technical realms where governmental institutions and corporations often stand, and onto a moral terrain (Martínez-Torres, Rosset, 2010). Together with sustainability and redistribution, reciprocity is understood by *Vía Campesina* as the basis of a social economy based on solidarity and is described as a practical form of grassroots community activism against "agribusiness as usual" (Via Campesina, 2013; Via Campesina, 2010). The strategies of *Vía Campesina* are especially relevant for this dissertation because they place values before technical solutions. These strategies suggest that a significant portion of small-scale farmers may find it more relevant to act upon what they deem to be morally right than achieving the goals of mainstream agriculture, such as efficiency, productivity, and economic growth.

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120 "We commit ourselves anew, with greater strength, to the goal of achieving that complex but necessary true gender parity in all spaces and organs of debate, discussion, analysis, and decision-making in *Via Campesina*, and to strengthen the exchange, coordination, and solidarity among the women of our regions. We recognize the central role of women in agriculture for food self-sufficiency, and the special relationship of women with the land, with life, and with seeds" (Via Campesina, 2008).

May the strengthening of *reciprocal voices*, forms of organization, and exchange in small-scale farming communities be considered as a counter-hegemonic strategy to loosen the grip of technocracy and neoliberal policies on agriculture? In the following section, I will focus on the roles of *voice* and reciprocity in small-scale farming and will attempt to underline their significance for the livelihoods of small-scale farmers and their communities.

3.7. *Voice* and reciprocity in the livelihood of small-scale farmers.

By focusing particularly on Mexico and Tanzania, I will study the cultural roles of *voice* and reciprocity in small-scale and subsistence agriculture and will attempt to elaborate and sustain the following claims:

- Small-scale agriculture is not only based on traditional or contextualized agricultural techniques, but also on rich cultural environments founded on complex yet fragile mixtures of reciprocity and independence, sometimes associated with self-interested economic behaviors.

- Although small-scale agriculture is severely threatened by neoliberalism, the very hybridity of values and practices within its social environments may be a significant factor for its resilience,[121] albeit a precarious one.

I will attempt to support these claims from the perspective of agroecology:[122] a scientific discipline as well as a social, cultural and political movement of which *voice* and reciprocity are underlying principles.

3.7.1. Reciprocity in agroecology.

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121 Resilience in agriculture may be defined as the capacity of socioecological systems to "adapt and change in response to critical signals, or have inbuilt redundancy to withstand shocks" due to biotic factors, such as climate, or abiotic ones, such as markets (Almås, Campbell, 2012, p.7).

122 Agroecology is a field of knowledge that uses ecological theory to study, design, manage, and evaluate agricultural systems that are productive but also respectful of the environment. Agroecology considers the interactions between biological, physical, technical, social, and economic factors that are relevant to farming systems. Because of its practical implications and holistic scope, agroecology has been described not only as a scientific discipline, but also as a social, cultural, and political movement (Altieri, 1989; Gliessman, 2000; Toledo, 2011).

The prevailing notions that agriculture based on productivity and industrial processes and augmented by high-end technological innovation is the only way to achieve food security, and that traditional knowledge and practices are the cause of food shortage and poverty seem to remain largely unchallenged. However, the IAASTD report proposed that agroecological farming may be a viable solution towards sustainable food production, since it enables farmers to further improve and develop their own methodologies, including the possibility of incorporating those kinds of innovations in agriculture they deem fit for their purposes (IAASTD 2009a).

Reciprocity is a fundamental value found in different aspects of the agroecological model favored by a growing number of small-scale farmer organizations, particularly in Latin America (Toledo, 2011). Reciprocity seeks to consolidate traditional forms of knowledge, organization, and production into a complex, multifaceted model of agriculture that may be applied as an alternative to industrial models. The following table (adapted from Toledo, 2011) identifies the reciprocal features of agroecology and contrasts them with the values of industrial agriculture:

Industrial agriculture	Agroecology
Reductionist, expert-driven scientific approach.	Holistic, multidimensional approach: reciprocal dialogue between systems and disciplines.
Dependence on closed, decontextualized technologies.	Technological transformation and self-sufficiency: reciprocal relation between local culture, environment, and technology.
Epistemological hegemony: only scientific/expert knowledge is considered valid.	Reciprocal dialogue among traditional and scientific systems of knowledge.
Control and domain over natural processes.	Reciprocity between agriculture and natural processes.

Table 2. The reciprocal features of agroecology. By Eugenio Tisselli (2015), adapted from (Toledo, 2011)

The social and cultural components of agroecology are highly sensitive to a wide diversity of contexts and therefore may aptly reflect local values. These values which, in many cases, may be tightly intertwined with agriculture and local knowledge systems, may help to inform, reshape, and reposition the globally dominant system of agricultural knowledge, science, and technology (Gonzales et al., 2010).

3.7.1.1. Bridging scientific and farmer-held systems of knowledge.

The Traditional Ecological Knowledge approach, defined as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1999, p. 8), is a means to encompass and integrate local values into agroecology. This approach may adequately help to identify and strengthen reciprocal values found in indigenous knowledge systems because of its multidimensional perspective, its challenge of scientific orthodoxy, and its attention to the different reciprocal relations between humans and non-humans (Dudgeon, Berkes, 2003).

It is important to acknowledge that not all farmer-held knowledge is necessarily traditional or ecologically resilient, as the contents published by the participants of the case studies in Tanzania and Mexico may demonstrate.[123] Correspondingly, not all scientific knowledge is blind to cultural, situated ecological issues in agriculture. Nevertheless, the fact that these two systems of knowledge have developed separately, often guided by contrasting worldviews, values, and methodologies, raises the need for building bridges of reciprocal communication between them. The Traditional Ecological Knowledge approach might be one of such bridges. Yet, precisely because of its multidimensional principles and practices, the approach has been criticized as being unscientific and potentially unsuccessful.

Because the Traditional Ecological Knowledge approach integrates spiritual and religious beliefs, often expressed and enacted as rituals, critics have argued that it is unscientific and should not be made a part of environmental assessments (Dudgeon, Berkes, 2003). However, traditional agricultural knowledge evolved reciprocally with culture, and therefore also with religion and spirituality. Contrary to the indiscriminate notion that spiritualism and rituals, often dismissed as mere forms of superstition, are inconsistent with scientific methodology, a significant number of traditional beliefs have been shown to agree with scientific theories. In Mexico, for instance, scientific research has shown that ancient astronomical

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123 I will discuss this issue in chapter 5.

observations, which have survived in the form of solar and lunar ritual calendars applied to agricultural cycles, have an important relation with the quality of maize and other crops (Ramos, 2007). I posit that these beliefs may play a symbolic role by establishing reciprocal forms of relation and exchange with the environment.

During the case study in Oaxaca, I had the chance to participate in a ceremony in which food was offered to the Earth, so that it would yield a good harvest. I was invited by Germán Vázquez, one of the participants of *Los ojos de la milpa*. We went to his family's *milpa* and drank half a gourd of *tepache*.[124] We poured the other half on the soil, while Germán said a prayer in Mixe. While this offering ceremony may be easily dismissed as mere superstition, I suggest that Germán may have followed the traditional cultural forms of the Mixe people with the intention of establishing a reciprocal relation with his *milpa*.[125] Through this ritual, Germán was not only making an offering of *tepache* so he could later have maize: he was also recognizing the *milpa* as a subject of reciprocity, as a living entity worthy of respect and care.[126]

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124 *Tepache* is a sweet, slightly fermented pineapple drink with crushed maize kernels.

125 My observations agree with those made by anthropologist Frank J. Lipp, who closely studied the Mixe culture and further described how all the participants of the offering ceremony later became engaged in the planting of maize seeds through communal, reciprocal labor (Lipp, 1998).

126 These offering rituals were documented in *Los ojos de la milpa* on April 3rd and April 10th of 2012. See: http://sautiyawakulima.net/oaxaca/oaxaca.php?c=3&date=2012-04-03 and http://sautiyawakulima.net/oaxaca/oaxaca.php?c=3&date=2012-04-10 (both retrieved on 07.04.2014).

Figure 17. A tepache ritual in Tlahui. The sound recording that accompanies this picture, published by a participant of Los ojos de la milpa, was translated as follows:

"- May our maize sprout and grow well, may the weather be favorable for its growth; this is what I ask, brothers, sisters, compadres, receive this tepache. Let's toast!

- We receive this tepache. I will say some words... we have come to give our hands and our feet, in the measure that the Giver and Creator of life allows us to, and so we ask him to offer us his help and protection..."

Photo published by a participant of Los ojos de la milpa in Santa María Tlahuitoltepec, on April 3, 2012.

Figure 18. Tepache ritual performed in a milpa in Tlahui. Photo published by a participant of Los ojos de la milpa in Santa María Tlahuitoltepec, on April 3, 2012.

Rituals are not highly regarded in modern societies because they represent value-based practices that are not operational. They tend to be dismissed as obstacles to the efficient flow of information, production, and communication (Han, 2013). However, I propose that traditional rituals, such as the one I experienced in Oaxaca, may contribute to the establishment of a reciprocal relation with the earth through *voice* and action. Through the ceremonial observation of *reciprocal voice*, traditional farming labor may escape the pure rationalism of productivity and efficiency and thus come under the guidance of more resilient and culturally respectful principles. Moreover, the persistence of ceremonial cultural forms is closely related to the symbolic resilience of farming communities (Cohen, 1985). The survival of spirituality and rituals may have strongly contributed to strengthen the cohesion of farming communities even after the dismantling of their social and political structures because of colonization or other external pressures.

However, the spiritual and cultural elements found in traditional ecological knowledge do pose a potential danger: that of idealizing *the other*, that is, indigenous peoples, while effectively silencing their *voice*. This risk is akin to the notion of *orientalism*, as proposed by postcolonial theorist Edward Said: a cultural and

political fact that establishes and forces stereotypes on non-Western cultures, essentializing them as static and undeveloped (Said, 2003). Orientalism tends to patronize cultures outside the Western model while effectively denying their *voices*, values, and political agency. Moreover, contemporary orientalism is not limited to Middle Eastern, Asian, or North African societies, and has a strong tendency towards the objectification (and therefore the potential commodification) of entire cultures.

In Mexico, for instance, the spectacle of indigenous rituals is often offered as a colorful cultural commodity for touristic purposes while, at the same time, the *voices* and political demands of indigenous communities are largely ignored at aggregate political levels. In Oaxaca, the ceremony known as Guelaguetza (roughly translated from Zapotec as "reciprocity"), originally an indigenous celebration of reciprocity related to mutual labor and support, has been co-opted and institutionalized since 1932 as a *racial tribute* by local politicians and exploited by entrepreneurs as a major yearly showcase to attract tourists (Montes, 2005).

I suggest that the knowledge held by indigenous people needs to be analyzed and understood in its own terms and full complexity, without reducing or idealizing it and without seeking to blindly extrapolate its beliefs and rituals in order to inject them into other cultures. Similarly, attempting to *elevate* any form of traditional knowledge to the category of *science* would deny not only its intrinsic value but also its biopolitical potential of creating counter-hegemonic subjectivities. If traditional forms of reciprocity in farming communities are to be strengthened, it may be necessary to respect them for what they are in the first place, instead of seeking to transform them so that they may fit into models that may be more acceptable in modern societies.

The Traditional Ecological Knowledge approach challenges expert-based scientific orthodoxy in favor of a *cross-community* knowledge system based on the notion of sustainability, in which research is co-produced by scientists and small-scale farmers (Kates et al, 2001). Here, a systemic approach must remain sensitive to reciprocal evolutionary processes, based on the detailed observation of the dynamics of the natural environment, their linkage with social systems, and the strengthening

of sustainable practices that increase resilience. Thanks to this perspective, the study of traditional ecological knowledge explicitly acknowledges context, which is provided by culture, values, and history. Therefore, this approach suggests that there is no single way of knowing or understanding *the truth* and that there is much to be learned from other cultural practices and worldviews. Critics of this approach have argued that conventional science has proved successful in responding to the demands of development (Sillitoe, 1998). But, as I have attempted to argue, those critics seldom consider sustainability and respect for diversity, whether natural or cultural. In some cases, they tend to regard traditional ecological knowledge merely as a resource that may usefully inform scientific practice and development programs (Sillitoe, 1998; ICSU, 2002; Kaihura, 2003a). An extractive attitude is implied in this position, and therefore may be regarded as a form of appropriation or colonization of traditional knowledge.[127]

Linda Tuhiwai Smith, a professor of indigenous education, argued that scientific research is not an innocent or distant academic exercise, but an activity that has something at stake and that occurs within specific cultural and political contexts, and therefore needs to be decolonized (Tuhiwai, 2002). Decolonization, however, does not entail a rejection of conventional science, but rather argues in favor of putting indigenous concerns and worldviews at the center, using them as lens to guide research.

"Indigenous peoples want to tell our own stories, write our own versions, in our own ways, for our own purposes. It is not simply about giving an oral account or a genealogical naming of the land and the events which raged over it, but a very powerful need to give testimony to and restore a spirit, to bring back into existence a world fragmented and dying" (Tuhiwai, 2002, p. 28).

In a similar vein, I argue that *voices* coming from the *outside* of hegemonic rationalities need to be heard, not only to inform and enrich scientific research, but

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[127] In my visits to Santa María Tlahuitoltepec, different members of the community showed a degree of mistrust towards researchers, arguing that those people "came from far away" to study their culture and then left without giving anything back. The results of scientific research were not only inaccessible for the community, but also failed to comply with basic reciprocal norms. Thus, scientific research tended to be regraded in the community as a form of appropriation.

also to be fully recognized and included in the bringing forth of alternatives to the predatory practices of neoliberalism. Giving legitimacy to traditional ecological knowledge, thus, may entail the strengthening of *reciprocal voice* and political agency of farming communities.

3.8. The relevance of reciprocity in the resilience of small-scale farmers.

3.8.1. The case of Mexico.

In chapter 1, I introduced the concept of *comunalidad*, which stands at the basis of the *internal normative systems*[128] of communities located in the Mixe region in Oaxaca. I propose that this concept may be regarded as a local political manifestation of traditional ecological knowledge and therefore considered as the source of a particular worldview that guides social processes in Mixe communities, including agriculture. Floriberto Díaz identified the reciprocal nature of *comunalidad* through one of its main immanent features: a relation of mutual belonging (instead of ownership) with the Earth, based on communal labor (Díaz, 2007). Jaime Martínez Luna, an indigenous intellectual of Oaxaca, further argued that this reciprocal relation was also based on observation and experimentation from which learning was derived (Martínez, 2009). According to Martínez, this strong link to the Earth rendered cooperation, reciprocity, and solidarity as natural traits of indigenous communities. The conceptual framework of *comunalidad* has been used to study the reciprocal management and defense of natural *commons*, such as forests, in the highlands of Oaxaca (Gasca, 2014). In agriculture, the values of *comunalidad* may manifest in different ways. Lands for cultivation are communally owned, and food is produced only in sufficient quantities, that is, to satisfy subsistence needs. If there is a surplus production of seeds, they are exchanged (Martínez, 2009).

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128 In Mexico, internal normative systems in indigenous communities, also known as customary rights, are legal systems that are not established as written laws, but are nevertheless observed. The conditions for internal normative systems to be recognized as such are repeated and generalized usage over time and a consensual agreement on their obligatoriness (González, 1994).

Anthropologist Roberto J. González argued that the goal of the traditional ecological knowledge held by communities in Oaxaca was to achieve *mantenimiento*, a Spanish term literally meaning "maintenance."[129] The concept of *mantenimiento* refers to the distinct moments in the life cycles of crops, food preparation, and consumption, as well as their common aim: household maintenance over the course of human lifetimes (González, 2001). According to González, agriculture in the highlands of Oaxaca is guided by a number of conceptual notions:

- A personified and living Earth.

- A recognition of the importance of reciprocity.

- An emphasis on the quality of food.

- The necessity of maintaining a humoral balance in their diets, their land, and other spheres.

- A long-term view of maintaining their households and lands.

(González, 2001)

As revealed by these conceptual guidelines, agriculture linked to *comunalidad* or *mantenimiento* clearly stands as a sustainable alternative to industrial agriculture. González found that these guidelines were the fruit of the dynamics between direct experience and received wisdom, and that the agricultural practices related to them became internalized through labor in the *milpa* (González, 2001).

In the agriculture of the highlands of Oaxaca,[130] the norms of reciprocity extend beyond the interaction between humans to encompass the relation of humans with their environment and reflect a willingness to care and be cared for. However, as discussed in chapter 1, strong reciprocity also entails forms of coercion as means to control those who disregard it. Therefore, important questions may arise: how can reciprocal attitudes be maintained in the context of communal agricultural labor? Is

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129 González identified the concept of *mantenimiento* while studying the culture of the Zapotec community of Talea de Castro. Although the Zapotec and Mixe cultures are related to different linguistic families, and therefore to distinct symbolic constructions and worldviews, I suggest that there is a strong conceptual relation between *mantenimiento* and *comunalidad*. Moreover, both Talea de Castro and Santa María Tlahuitoltepec belong to the Sierra Norte region of Oaxaca, and thus share a common ecological environment that favors similar farming practices.

130 Unlike other parts of Mesoamerica, where farmers were evicted from their lands and forced into salaried labor in large-scale commercial plantations, subsistence agriculture in the Sierra Norte of Oaxaca was able to survive the colonial period, most likely because of the remoteness of communities and the topographical qualities of the region (González, 2001).

coercion an effective way of maintaining them? Following my observations in Tlahui, I recognized that reciprocity no longer exists in a pure form within the community (if it ever did), and that it may be found mixed with some of the individualistic and rational features of contemporary societies. During the development of *Los ojos de la milpa*, I found diverse attitudes towards mandated reciprocal labor, or *tequio*. Froylán Vázquez, one of the participants of the case study, had to leave the project because he was selected by the community assembly to become a *topil*, or communal police officer. While Froylán accepted his task rather willingly, Odilón Martínez, the local coordinator of the case study, was openly upset by the coercion of the *tequio*. Mr. Martínez was born in Tlahui, but lived and worked in the city of Oaxaca, the state capital, and he protested against the system of reciprocal labor because, in his view, it represented an obstacle to the development of his professional career as an agronomist. If the popular assembly in Tlahui had selected him to perform an unpaid public task, which would normally last for one year, he could always reject the appointment. However, his rejection would disqualify him from receiving further appointments and would thus entail a progressive exclusion from public life in the community. More subtle forms of coercion are also embedded in the local culture. As González observed, failure to perform rituals such as the one I experienced in the *milpa* of Germán Vázquez is believed to result in bad luck (González, 2001).[131] From these observations, it appears that the coercion exercised to enforce reciprocity might, in some cases, be perceived as a form of tyranny or oppression.

Despite the fact that some internal normative systems in Oaxaca are based on reciprocity, I was able to observe acute and complex conflicts between individual and common interests. In chapter 2, I described how people in Tlahui implemented in their community the system of *casetas* by transforming fixed phones into communal communication devices. I argued that *casetas* represented the community's will to transform technology in a way that would better suit their reciprocal values. However, in Ayutla, a Mixe community not far away from Tlahui, the owners of *casetas* sabotaged the single cell phone antenna that had been installed, preventing their peers from having access to mobile coverage. They physically damaged the

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131 During the ceremony in the *milpa*, Germán Vázquez told me that he was very keen on performing all the elements of the ritual "properly," because he didn't want to risk having the bad luck that his neighbors had had. The night before the ceremony, a thunderbolt had burned his neighbors' home, killing everyone inside.

antenna and rendered it useless because they saw it as a direct threat to their business.[132] On the surface, this conflict may be seen as a struggle between a shared system of communication, which apparently fits the values of the community, and an external, imposed one that represents the individualism prevalent in modern Mexico. However, I suggest that it has deeper, paradoxical implications. The cell phone antenna was destroyed to protect the individual interests of the owners of *casetas* and effectively resulted in the exclusion of the community of Ayutla from mobile communication. Therefore, this conflict reveals that the introduction of a new technology into a traditional community introduces social tensions as well, but also that it cannot be assumed that reciprocity exists in a pure, frictionless form, even in communities in which reciprocity is a central value in the internal social and political systems. Does such conflict suggest that a neat division between traditional forms of knowledge and modern rationalities may not be traced? It seems that societies in which reciprocal indigenous traditions have persisted have also been permeated (through colonization and, subsequently, globalization) by modern values such as individualism.

Concepts existing in societies that hold different forms of traditional ecological knowledge have been transformed through a *mobilization* of ideas favored by what may be regarded as the social construction of global ecological problems (Dove et al., 2003). These ideas not only include environmental concepts related to agricultural practice, but also cultural values. Because of such mobilization of ideas, local interpretations and contextualization of concepts and values, the once-held notion of a division between Western and non-Western cultures may no longer be realistic. Thus, it would be more accurate to think about hybrid cultures, in which several systems become historically inter-mingled. Consequently, the division between East and West or South and North when discussing agricultural knowledge and practices may be regarded as an essentialist fallacy (Dove et al., 2003). Such a tense coexistence suggests, precisely, that the mobilization of concepts is not politically neutral and reveals the existence of power relations that tend to be asymmetric, as the knowledge systems and practices of those in power are often

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132 This episode was described by an informant from Ayutla during the development of the case study in Tlahui. I could confirm that, in fact, there was no cell phone coverage in Ayutla at that time.

imposed on those who are governed.

In chapter 1, I described how the symbolic construction of a community allowed its members to bestow new meanings upon existing symbols or to preserve cultural meaning as new symbols were introduced. I claim that this specific mechanism of cultural resilience has enabled indigenous societies to survive and persist despite the introduction of new ideas, practices, and technologies that might potentially disrupt their traditional worldviews. González, for example, described how Zapotec farmers have historically incorporated the cultivation of cash crops such as sugarcane, coffee, cochineal, and cotton, introduced by Spanish colonizers and grown in plantations, into their own traditional practice, mixing them with maize and beans in the *milpa* (González, 2001). This mixed agricultural system suggests that Oaxacan farmers found resilience in hybridity: without losing their subsistence base, they also participated in global economic markets. Correspondingly, complex mixtures of reciprocity and individualism may be revealed in the study of small-scale farming communities in Mexico. But may such mixture be observed in other places?

3.8.2. The case of Tanzania.

In Sub-Saharan Africa, little is known about the cultural perception of nature and the environment (Kesby, 2003). However, Africans categorize nature in a system of cognition that has been inferred from their vocabularies, and is considered to be the fruit of a refined observation (Kesby, 2003). The precise relationship of Africans to the conditions of their environment may be illustrated by a subtle aspect of the failed Tanganyika Ground Nut Scheme described earlier. The failure of the British enterprise was not only due to the introduction of a decontextualized technology, but also to the colonizers' deafness to local knowledge about soils, vegetation, and weather conditions (Kesby, 2003). One of the areas designated for the scheme was known to the locals as "drought country" and, although it might have looked just like any other area to European eyes, nearby inhabitants knew that the rainfall there was particularly unreliable (Kesby, 2003).[133] Therefore, the area was not suitable for

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133 To this day, the availability of water seems to be the main decision factor for farmers as they occupy new lands (Waters, 2007).

agriculture; however, none of those favorable to the endeavor ever thought of asking the locals about the conditions of that area, which ultimately, played a significant role in the scheme's failure (Kesby, 2003).

Sociologist Tony Waters argued that contemporary Tanzanian small-scale farmers tend to be highly independent and reluctant to embrace the opportunities offered by modern labor markets. According to Waters, the key to understanding these attitudes is the ready availability of arable land. However, Waters also suggested that modern markets may be understood by small-scale farmers as a contradiction to their traditional reciprocal values. Reciprocal values in Tanzanian farming communities persist in the form of personal obligations felt towards extended kinship groups, and these exist independent from monetized labor markets (Waters, 2007). Although these values have been severely distorted and infiltrated by the values of colonizers and other external influences, Waters claimed that they are still at play in daily life decisions. To illustrate, Waters described a *Food for Work* program that was offered to small-scale farmers. In exchange of *self-help* labor, such as building schools and clinics or fixing roads, farmers received in-kind remuneration, mainly rice and beans, provided by the UN's World Food Program (Waters, 2007). However, the farmers failed to collaborate, and the program was changed so that labor was not compensated with food, but instead had to be provided without remuneration for the benefit of the community. This shifting of the exchange from economic incentives to mutuality yielded good results. Thus, the policy makers' assumption that people would only work following the logic of modern labor markets was not valid (Waters, 2007). Thus, one of the most significant conclusions of Waters's example was that the activities of small-scale Tanzanian farmers were not primarily driven by profits. Instead, farmers largely guided by the interest and moral demand of reciprocity and loyalty towards family and kinship.

However, one implications of this form of reciprocity is tightly linked to government aid and relief. Waters suggested that Tanzanian farmers often understood kinship obligations as something that encompassed the governments' obligations towards their communities, and therefore saw government aid (whether food or money) as a moral duty (Waters, 2007). Indeed, during one of my visits to

Tanzania, I was informed that the Tanzanian government regularly supplied farmers with maize seeds. While my informant agreed that aid was an adequate approach in cases of drought, he complained that shortages of maize were mostly caused by farmers not saving their seeds and selling off all their harvests. This situation, in which farmers accepted aid as a moral obligation on one hand, and sold their seeds for profit on the other, may partially contradict Waters's observations. I suggest that it may be understood as a situation in which kinship obligations and reciprocity coexist with individualist, market-driven interests: in other words, a hybrid scenario.

The informal economy of exchange and mutuality is densely and tightly interwoven with modern markets, which in Tanzania are increasingly being influenced by the logic of neoliberalism. Serge Latouche claimed that the informal economy presents a hybrid, alternative model of development, one that is based on social relations and values and that strongly implies the notion of community (Latouche, 2007). He also observed that, although the informal economy coexists with the monetized economy, the individualistic attitudes associated with the latter have not been predominant in African societies. In fact, Latouche claimed that the "polymorphic solidarity" of reciprocal exchange may be understood as a way to reaffirm communal identities in the face of modern markets (Latouche, 2007, p. 41). However, in accordance with Waters, he also described how reciprocity may have its disadvantages: the reinforcement of hierarchical relations, inequality, and corruption. Therefore, it may be important not to consider reciprocity as an absolute and universal model with which to counter the self-interest of neoliberal markets.

Rather, I posit that reciprocity might be strengthened and encouraged as a form of resistance and, as Latouche suggests, as a means to gradually achieve *de-economization*, that is, shifting the subjection of nature and culture away from economic rationality (Latouche, 2007). Because of the hybrid nature of societies where informal economies prevail, such as communities of small-scale farmers in Tanzania and Mexico, Latouche considered reciprocity as a key weapon in a "silent guerrilla" war against neoliberalism (Latouche, 2007, p. 211). But hybridity may not only be observed in the sphere of economic exchange: as I have argued, it also manifests itself in the mixture of cultural values. Thus, the strong ties to kinship

obligations described by Waters can coexist with the independent and self-sufficient life offered by the farm (Waters, 2007). Might such hybridity be seen as a potential for flexibility and adaptation to new economic and cultural models? Could it give small-scale farmers the capacity to resist by constantly finding new ways to achieve resilience?

Most of the production of Tanzanian farmers never enters the marketplace, since it is destined for subsistence. Yet, it is nevertheless tied to the fluctuations and volatility of global markets, particularly through the prices of cash crops (Waters, 2007). Much trade is still done via barter, but money is becoming increasingly important and accessible. Besides economic and cultural mixtures, the hybridity and resilience of small-scale farmers may also reside in the farmers' skills to cultivate a wide variety of crops as a way to prevent famine. In Bagamoyo, I witnessed a wide diversity of crops being grown as a strategy against drought. It appeared that, while the intention of such diversity was resilience and adaptation to shifting climate patterns, it was also aimed at securing income in the face of unstable markets. But how long could such a hybrid model of permanent adaptation stand? According to Waters, modern socio-economic power slowly but surely pulls small-scale farmers into global marketplaces, suggesting thus that the hybrid livelihoods of Tanzanian farmers and their communities might represent a transitional state between their traditional forms and neoliberalism (Waters, 2007). In face of their resistance against global markets and the dismantling of their communities and cultures, I claim that the current hybridity of subsistence farmers may indeed be considered as a resilience strategy, albeit an extremely unstable one. While it may be possible to claim that neoliberal values have not yet taken root in the contexts of the case studies in this dissertation, their traditional reciprocal social relations and forms of exchange are threatened by the expansion of those values. Therefore, the possibility of freely enacting reciprocal values, norms, and forms of production and exchange in their social and ecological contexts could become a source of resilience.

For example, the reciprocal values that guide the participatory breeding processes of cassava, which I could witness during my visits to Bagamoyo and Zanzibar, may support this claim. Farmers in both localities were actively engaged,

together with local agricultural institutions, in the participatory breeding of new cassava varieties. Participatory breeding processes are significantly different from conventional breeding, as they involve collaborative efforts. Testing and selection take place on farms rather than agricultural stations or industrial facilities, key decisions are taken jointly by (mostly women) farmers and professional breeders, and the process can be implemented simultaneously and independently at a large number of locations. Furthermore, farmers may multiply promising hybrids in village-based seed production systems, thus making faster progress toward seed release and multiplication of varieties that are acceptable by farmers (IAASTD, 2009b). Such participatory approaches in agricultural research[134] have been criticized on the basis that they lack robust methodologies and seldom produce effective outcomes (Ashby, 1990; Bentley, 1994).

However, I posit that participatory approaches might also be judged on the measure by which they reinforce reciprocal values. In truly participatory processes such as collaborative breeding, farmers and scientists become immersed in *cross-community*, reciprocal processes of diagnosis, design, experimentation, and feedback in which the power to control research is shared equally. Furthermore, participatory breeding may also be understood as a significant effort to contextualize techniques and methodologies, contrasting with the decontextualized solutions, such as industrial hybrid seeds or GM crops. Despite the criticism of poor results in participatory approaches, I observed that the concrete outcomes of participatory breeding of cassava in Bagamoyo and Zanzibar, where farmers had collaborated in the development of local varieties, included higher resistance to pests, increased water efficiency, and a high level of acceptance based on the organoleptic qualities of the resulting crop. These local varieties were made available to any farmer who requested them, thus expanding reciprocity and collaboration towards openness and resilience. However, reinforcing the reciprocal aspects of these research practices may be relevant, as they are threatened by seed patent policies that, if implemented

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134 The practice of participatory breeding may be identified within the emerging field of Farmer Participatory Research (FPR). While FPR tends to be viewed as a means to instrumentalize farmers' knowledge and participation in order to inform scientific research and technological development and to increase the efficiency and productivity of development programs (Cornwall et al., 1993; Freeman, 2001; Ajeigbe, Dashiell, 2010), it is also understood as way to engage a learner-centered, place-dependent, ecologically informed model for agricultural development (Chambers, 1994; IAASTD, 2009b). Besides pragmatic objectives, FPR projects have been implemented for ethical and political reasons, such as increasing equity and strenghtening the "bargaining power" of small-scale farmers (Van Veldhuizen et al., 1997).

in Tanzania, would forbid participatory breeding and free distribution of new varieties (Saez, 2013).

An additional observation that may support the claim that reciprocity might be a source of resilience for farmers is their explicit interest in exchanging knowledge about agriculture with others. As I will discuss in chapter 5, the Tanzanian farmers who took part in the case study expressed their desire to extend the project to other farmers in remote places so that they could learn about their practices and perhaps also teach them their own. This is a significant aspect of what the farmers meant when they said that they wanted their *voices* to be heard. I suggest that they demanded an unfiltered medium where they could engage in a process of participatory mutual learning; where they could reciprocally exchange *voices* carrying knowledge about their agricultural *commons*. The open and mutual exchange of knowledge about a *commons* is not only vital for its management, but especially important in times of uncertainty regarding climate.

A 2014 report issued by the Intergovernmental Panel on Climate Change (IPCC) stated that very few studies had considered the impacts of climate change on cropping systems for scenarios where global mean temperatures may increase by 4°C or more (IPCC, 2014). However, the report warned that these scenarios include, with a high level of confidence, "large risks to global and regional food security, and the combination of high temperature and humidity compromising normal human activities, including growing food or working outdoors in some areas for parts of the year" (IPCC, 2014, p. 14). Through the informal interviews I conducted, I concluded that Tanzanian farmers in Bagamoyo were already perceiving the local effects of climate change and expressed their concern at erratic rain patterns or other indirect and unprecedented events such as higher incidence of pests and crop diseases.[135] Uncertainty about these effects may have prompted the farmers who participated in the case study to exchange knowledge about agricultural practices and techniques with others. Can the reciprocal exchange of *voice* become a significant source of resilience in times of uncertainty?

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135 Contrasting with the scenario in Bagamoyo, I was not able to detect open concerns about climate change during interviews with farmers in Tlahui. When asked, they tended to respond that the local climate was behaving as usual.

3.9. *Reciprocal voice* as a strategy for epistemological transformation.

Although scientific studies have recognized that adaptation to climate change should be essentially local and should include participatory approaches, little has been done to embed indigenous peoples' reciprocal views of community and environment into the process (Jones, Thornton, 2005; Nyong et al., 2007; IPCC, 2014). Nevertheless, inclusive approaches that recognize indigenous views and values are increasingly called for by those who advocate agroecological models.

"The alternative worldviews of traditional peoples could provide insights for redirecting the behavior of the industrial world towards a more sustainable path" (Berkes et al., 1995, p. 299).

In a similar vein, González argued that alternative subsistence strategies such as those followed by farmers in Oaxaca may be "more valuable as structural models for the future rather than as quaint survivals from the past." (González, 2001, p. 238). These considerations converge in agroecology which, rather than rejecting scientific ecological knowledge and methods, aims at hybridizing them with the traditional ecological knowledge of local small-scale farmers. The learning approach in agroecosystems management, for example, is based on an equal exchange of knowledge between rural communities and private and public institutions, and seeks to combine different systems of knowledge to ensure environmental sustainability and dignified livelihoods (Lightfoot et al., 2001). Moreover, even if traditional ecological knowledge may be currently found in an impure, hybrid form, it may still contain reciprocal values that can provide a key towards more sustainable and respectful models of agriculture.

Achieving goals such as *food sovereignty*, the legitimation of the Traditional Ecological Knowledge approach in scientific contexts, or farmer participatory adaptation to climate change, may entail the activation of *reciprocal voice* as well as a deeper epistemological transformation. The notions of what knowledge is and how

it can be acquired may need to undergo a radical transformation in order to loosen the grip of the modern rationalisms that deny the values and symbolic constructions of indigenous cultures.[136] Agricultural ecologist Michel Pimbert argued that, in the context of agriculture, knowledge needs to be transformed to counter the "economic genocide" of small-scale farmers brought by global policies in food and farming, but also to oppose reductionist scientific views that have failed to promote sustainable agroecosystem and natural resource management (Pimbert, 2006). Among the recommendations for achieving the transformation of knowledge, Pimbert identified the key role of methodologies that strengthen "endogenous knowledge creation," closely related to *reciprocal voice* (Pimbert, 2006, p. xi). Endogenous knowledge creation, in turn, entails the "de-institutionalization" of research for autonomous learning and action and "unrestricted access to learning tools"(Pimbert, 2006, p. xi).[137]

It is important to note that this vision opposes the call to "institutionalize farmer-scientists collaboration", a distinctive feature in the context of farmer participatory research (Ashby, 1990, p. 245). Through the description of the case studies and the ERV Methodology, I will discuss how I have attempted to negotiate the tension between the need to formalize *cross-community* collaboration between farmers and scientists and the opportunities for farmers to engage in open-ended, de-institutionalized processes of peer learning.

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136 Philosophers whose work is often characterised as post-structuralist, most notably Michel Foucault, have studied how systems of knowledge are socially constructed and therefore closely linked to cultural contexts and subjected to the dynamics of power struggles (Foucault, 1982). I have described how, within the sphere of modern agriculture, scientific and technical systems of knowledge have practically constituted a hegemony that has systematically neglected those which originated in indigenous contexts. Therefore, the renewed call for a deeper epistemological reconsideration of knowledge systems and their interrelatedness, originally a feature of post-structuralist thought, may be justified.

137 The idea of de-institutionalizing learning in contemporary societies may be illustrated by the work of philosopher Ivan Illich. In his work *Deschooling Society* (1971), Illich argued that the institutionalization of values led inevitably to social polarization and psychological impotence (Illich, 1971). He explicitly called for the usage of information and communications technologies to create webs of peer-learning, together with the emergence of values that could not be controlled by technocrats (Illich, 1971). More recently, the de-institutionalization of learning has been identified as a crucial part of the indigenous resistance against neoliberal hegemony (Rockwell, 2010). In this context, school and its equivalents are understood as institutions that tend to individualize small-scale farmers and produce a scarcity of knowledge, therefore facilitating its commodification (Martínez, 2010; Esteva, 2010).

3.10. Conclusions.

In this chapter I have claimed that emphasizing reciprocity in agriculture may be a factor in the alleviation of the dependency of world food production on the dynamics of global markets, which may yield negative results for small-scale farmers, their communities, and, in fact, for entire ecosystems across the planet. Moreover, neoliberal values and practices, together with decontextualized technological solutions applied to agriculture, have tended to exacerbate global problems. The apparent rationality of such values and practices may be questioned in the light of their contradictions. Under neoliberalism, small-scale farmers are compelled to increase their productivity in order to participate in global markets and coerced into adopting unsustainable technologies. Therefore, they stand in a position of disadvantage, as the economic value of their activities is subjected to dynamics that are beyond their control, and their income becomes compromised by an increasing dependence on agricultural inputs and technologies.

I have identified potential consequences of the progressive commodification and technification of agriculture, which are specifically relevant to this dissertation: the devaluing of *voice* and political agency of small-scale farmers, the marginalization of their reciprocal practices and forms of social and economic organization, and a widespread technological *solutionism* that is blind to *cross-community* approaches and gradual processes. Contrarily, I suggested that careful and respectful attitudes to agriculture may be intimately related to the reciprocal values which persist in certain small-scale farming communities. Moreover, I have argued that such attitudes imply a general appreciation of the values and symbolic constructions of indigenous cultures as valuable forms of knowledge that may contribute to the process of creating alternatives to the hegemonic model of agriculture.[138]

I have attempted to identify the importance of *voice* and reciprocity in subsistence agriculture. I suggested that the reciprocal values found in small-scale

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138 It has been estimated that industrial agriculture occupies more than 75% of agricultural land worldwide. However, more than 90% of those who grow crops are subsistence or indigenous farmers (GRAIN, 2014).

farmer communities persist in fragile social and economic scenarios that are rapidly shifting towards neoliberalism. The hybrid scenarios found in small-scale communities in Tanzania and Mexico may be sources of resilience; however, they may also be understood as transient, precarious states of symbolic and practical adaptation. In these scenarios, reciprocity coexists with values such as individualism. Nevertheless, as I have observed, values associated with neoliberalism may eventually absorb the different forms of reciprocity that persist in small-scale farming communities, unless resistance is exercised. Resistance may emerge from social movements such as *Vía Campesina*, or from alternatives to reductionism and decontextualized technologies, as proposed in agroecology. I suggest that these multiple forms of resistance may, in many cases, be considered as forms of biopolitical agency, in which *reciprocal voice* has an important role to play.

As discussed in chapter 2, information and communications technologies may play a significant role in the reciprocal exchange of *voice*, not necessarily through the coercive measures commonly associated to strong reciprocity, but rather through the induction of social responsivity and the active transformation of technological means. I posit that such an induction of *reciprocal voice* may support the epistemological transformation that might enhance the *cross-community*, de-institutionalized exchange of agricultural knowledge (particularly traditional ecological knowledge) in small-scale farming communities. Studies from multiple disciplines have concluded that the pursuit of sustainable agriculture will require an increase in knowledge-intensive farming practices where small-scale farmers are considered not only as recipients, but also as producers of valuable knowledge (Matson et al., 1997; Tilman et al., 2002). Unfortunately, such a shift is yet to come. However, information and communications technologies can become useful elements for achieving that shift. If those technologies are used to reinforce *reciprocal voice*, they may become effective vehicles for the exchange of agricultural knowledge across different communities. In the next chapter, I will examine how information and communications technologies are being applied in small-scale agriculture.

Chapter 4: Information and Communications Technologies in Small-Scale Agriculture.

Introduction.

As expressed in the introduction of this dissertation, I have chosen to contextualize the case studies that constitute the practical component of this dissertation within an emerging field that seeks to apply information and communications technologies to improve small-scale agriculture, commonly known as *e-agriculture*.[139] I will attempt to claim that, despite their potential benefits, most e-agriculture initiatives may actually tend to silence *reciprocal voice* in small-scale farming communities. Consequently, I will analyze the implicit values in those initiatives, rather than their concrete outcomes and impacts. Such analysis implies, in turn, that improving the livelihoods of farmers through the introduction of technologies such as mobile phones and the Internet should not be at the price of sacrificing *voice* and reciprocal values and practices. Despite the fact that e-agriculture initiatives seek to bring direct and indirect benefits to small-scale farmers, such as enhanced access to information and markets, social inclusion, bridging gender divides or attracting youth, I will explore the following questions:

- Is there a tendency to design e-agriculture initiatives in a top-down, *solutionist* fashion?

- Do e-agriculture initiatives take into account cultural values and social contexts, or do they focus on narrow goals such as productivity or efficiency instead?

- May top-down, *solutionist* e-agriculture initiatives present potential risks to small-scale farmers?

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139 E-agriculture is an emergent field of practice that seeks to apply information and communications technologies to enhance the productivity and efficiency of small-scale farmers. In the available literature, e-agriculture is also referred to as *mAgriculture* (mobile agriculture) or, more recently, *ICT4AG* (information and communications technologies for agriculture).

As will become apparent in the following paragraphs, the most relevant e-agriculture initiatives have been carried out in African or Asian countries. However, since one of the case studies in this dissertation is located in Mexico, I will also look at the state of e-agriculture in Latin America and will attempt to analyze the possible reasons why the initiatives in this region are scarce and less visible than those in Africa or Asia.

4.1. E-agriculture.

E-agriculture is an emerging field in which information and communication technologies (ICTs) are applied to the improvement of agricultural practices and rural livelihoods. It is part of a broader field that aims at applying these technologies to different areas of development, such as health or education. The term *e-agriculture* was introduced as one of the key areas of application of information and communication technologies in the Plan of Action of the World Summit on the Information Society (WSIS), celebrated in Geneva 2003. In that document, the aims of e-agriculture were to utilize information and communication technologies in the dynamic dissemination of accessible, up-to-date information on agriculture, particularly in rural areas, and to employ these technologies as tools to increase food production, both in quantity and quality (WSIS, 2003). The inclusion of e-agriculture in the WSIS Plan of Action was based on a collaborative research project by the Overseas Development Institute, the UK Department for International Development, and the United Nations Food and Agricultural Organization (FAO), in which the Sustainable Livelihoods Approach[140] and information and communication technologies were brought together. The conclusions of this research were stated as seven policy recommendations on how to apply information and communication technologies to development:

1. Build on existing systems.
2. Determine who should pay (for the access to information and

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140 The Sustainable Livelihoods Approach is a conceptual framework that emphasizes "understanding the vulnerability context and the organizational and institutional environment within which poor people draw upon assets of different types in order to implement a livelihood strategy. It defines five types of asset: human capital, social capital, natural capital, physical capital, and financial capital" (Norton, Foster, 2001, p. 6).

communication technologies).

     3. Ensure equitable access.

     4. Promote local content.

     5. Build capacities.

     6. Use realistic technologies.

     7. Build knowledge partnerships.

     (Chapman et al., 2003)

These recommendations reveal a concern with bridging the technological gap between developed and developing social contexts, and seek to encourage the technological inclusion of the latter. In June 2006, FAO hosted the first e-agriculture workshop, bringing together representatives of leading development organizations involved in agriculture, and launched the first e-agriculture web community in 2007.[141]

Mobile communication technologies are presently the main focus of e-agriculture. In Africa, where most contemporary development projects for agriculture are concentrated,[142] Internet usage was still low in 2013, reaching about 15.6% of the population; yet it had increased more than forty times since year 2000, almost five times the average growth of the rest of the world.[143] In 2013, 63% of the population in Africa were mobile phone subscribers, and it is estimated that by 2016 Africa and Middle East will overtake Europe as the second largest region for mobile subscribers (ITU, 2013; Portio Research, 2013).

"Connected Agriculture," a joint research project on mobile communications and agriculture published by Vodafone, Accenture, and Oxfam, in 2011 reported that "Mobile communications can help to meet the challenge of feeding an estimated 9.2 billion people by 2050 ... [and] increase agricultural income by around US$138

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141 The e-agriculture web community is defined as "a global community facilitating dialogue and resources on the use of ICTs for sustainable agriculture and rural development" http://e-agriculture.org/ (retrieved 21.04.2014).

142 According to World Bank data, more than 1,000 projects were either active or recently closed in Sub-Saharan Africa in 2014, an amount that doubled the number of projects in other developing regions such as South and East Asia or Latin America. Source: http://www.worldbank.org/projects/search?lang=en&status_exact=Active^Closed&prodline_exact=GU^PE&mjsectorcode_exact=AX (retrieved 14.07.2014)

143 Internet World Stats: Usage and Population Statistics. http://www.internetworldstats.com/stats.htm (retrieved 21.04.2014)

billion across 26 of Vodafone's markets in 2020" (Vodafone et al., 2011). This report focused largely on Africa and other developing regions and, even if its predictions were not based on evidence and the market-driven interests of its publishers were explicitly stated, it nevertheless revealed that mobile communications may have an increasingly relevant role in agriculture. The report identified four major areas in rural agriculture that could potentially benefit from mobile services:

1. Improving access to financial services through mobile banking systems.
2. Accessing agricultural information.
3. Improving logistics throughout the supply chain.
4. Enhancing access to markets.
(Vodafone et al., 2011)

Sociological research on e-agriculture offered a different perspective on the usage of mobile phones, based on the actual activities carried out by farmers in Tanzania: preparations for farming, farming, sowing, harvesting, marketing, and transport, each with its corresponding subset of activities (Furuholt, Matotay, 2011). This farmer-centered research identified five key areas in which mobile technologies were useful for Tanzanian farmers:

1. Accessing timely information.
2. Making markets more efficient and transparent.
3. Providing advance warning of weather events and other risks.
4. Accessing complementary services, such as mobile banking.
5. Aiding in general communication and coordination.
(Furuholt, Matotay, 2011)

These findings suggest that Tanzanian farmers tend to use mobile technologies in a rather pragmatic ways. Mobile information services have become increasingly useful tools for farmers who live and work in remote areas with insufficient infrastructure, and where agricultural extension services are insufficient or nonexistent. But, beyond their usefulness, what are the implicit values of e-agriculture information delivery services?

4.2. A value-based analysis of e-agriculture.

The "ICT[144] in agriculture" sourcebook, published by the World Bank in 2011, recommends that strengthening e-agriculture initiatives and expanding their reach and scope should become central aspects of global agricultural policies. This recommendation includes two specific tasks for governments:

1. To empower poor farmers with information and communication assets and services that will increase their productivity and incomes, as well as protect their food security and livelihoods.

2. To harness information and communications technologies effectively to compete in complex, rapidly changing global markets.

(World Bank, 2011)

These tasks reveal a number of assumptions. First, that deregulated global markets will continue to fluctuate unpredictably and that, consequently, it will become necessary to adapt to their uncertainties, which include unstable food prices and an increased subjection of land use to global market trends. Therefore, productivity, competitiveness, and flexibility are presented as key skills that small-scale farmers need to acquire in order to adapt. Second, that the usage of information and communication should be subordinated to the task of adapting to global markets. The World Bank's vision thus depicts governments as mere facilitators of the process of integrating poor farmers into a global economic scenario whose dynamics are beyond the control of farmers, who are expected to become increasingly technified and productive entrepreneurs.

While the sourcebook issued by The World Bank stresses that there is credible evidence of the positive impact of e-agriculture, it acknowledges that a number of important questions about how to make innovations replicable, scalable, and sustainable for a broad and diverse population still remain unanswered (World Bank, 2011). The sourcebook condenses some of the most relevant lessons learned so far

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144 ICT: Acronym of information and communications technologies.

from e-agriculture initiatives:

1. Concentrate on the demand, not on the technology: e-agriculture projects should focus on farmers' needs rather than technological innovation.

2. Use appropriate technologies: in the design of e-agriculture initiatives, it is necessary to understand "local information and communication practices, barriers to ICT-enabled empowerment, and priority information and communication needs of end users."

3. Focus on affordable access and use, not ownership: e-agriculture must implement usage models that are appropriate for the local social, cultural, and environmental context.

4. Be aware of differential impacts, including gender and social differences in access and use: because of existing social and cultural divides, specific groups in farming communities, such as poor women, may be able to benefit less from e-agriculture initiatives than, for example, better-off male farmers.

5. Create enabling environments for innovation in infrastructure investment, business models, services, and applications: the success or failure of an e-agriculture initiative may greatly depend on the policy environment in which it is applied. According to the sourcebook, e-agriculture requires a strong but flexible regulatory environment strengthened by incentives for the private sector to make investments.

6. Promote leadership and find champions in agriculture: e-agriculture initiatives are often pushed forward by local leaders who make them visible and interesting to farmers, businessmen, and political authorities.
(World Bank, 2011)

The first four recommendations reflect a cautious stance towards the potential effects of information and communications technologies and suggest that the lessons of avoiding technological determinism and top-down, decontextualized approaches

might have been learned. Those recommendations may indicate that past failures have prompted a more nuanced role for technology, as well as an awareness of the importance of social, cultural, and environmental contexts. However, it may be important not to lose sight of the larger model envisioned by the World Bank: farmers are not expected to *develop* according to their own terms, but in terms of globalized markets, increased productivity, and competitiveness.[145] Thanks to the hybridity and adaptability of their cultures and social structures, many small-scale farmer communities have been relatively immune to the uncertainties of global markets, and their production has largely remained outside of monetized markets. But if local markets where small-scale farmers sell or trade their products become increasingly connected to global economic flows, as envisioned by the World Bank, they might become more vulnerable to uncertainties and uncontrollable fluctuations.[146] Therefore, I suggest that the apparently nuanced role of technology and the contextual sensitivity found in the recommendations issued by The World Bank may be understood in the light of the *2.0 rhetoric* described in chapter 2, which seeks to mask economic interests behind a socially engaged and inclusive discourse.[147]

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[145] In fact, the World Bank understands e-agriculture as a continuation of the course started by the Green Revolution. "The manifold benefits that accompany improvements in agricultural productivity are well known: farmers' incomes rise, food prices fall, and labor is freed for additional employment…. Technical innovation, most prominently demonstrated in the Green Revolution, has been key to improving agriculture in the developing world. Mobile phones, despite their recent entry into agrarian communities, are already helping farmers improve their activities" (World Bank, 2011, p. 51). Furthermore, one of the possible reasons why e-agriculture initiatives have focused on Africa is suggested by the sourcebook: "Green Revolution never arrived in sub-Saharan Africa but is sorely needed, given that almost all of the arable land is being cultivated" (World Bank, 2011, p. 87).

[146] While the global trade policies of neoliberalism may translate into greater instability for small-scale farmers, the negative effects of international markets on local production have become evident a long time before so-called free markets. For example, in the 1930s and 1940s, as the world economy was shocked by the Great Depression and World War II, prices of commodities such as sisal or coffee dropped in Tanzania. While the losses were absorbed at that time by the British colonial structure, the subsequent declines in world prices directly affected small-scale farmers and helped to prompt Tanzania into aid dependency (Waters, 2007). In the 1990s, the World Bank encouraged an overproduction of coffee in order to satisfy an increasing global demand. This resulted in extremely cheap prices, which drove millions of growers into poverty (Roberts, 2008).

[147] This claim may be supported by the fact that, besides supporting e-agriculture, the World Bank has openly promoted a global agricultural reform through its flagship project, "Enabling the Business of Agriculture." The goal of this project is to "provide policy makers with accurate, evidence-based data and analysis to help them improve policies for supporting inclusive growth in agriculture and bolster food security" (Source: http://eba.worldbank.org/~/media/GIAWB/AgriBusiness/Documents/Misc/EBA-Fact-Sheet-2015.pdf, retrieved 17.04.2015). However, a coalition of civil organizations called "Our Land Our Business" has explicitly opposed the project by claiming that it enables land grabbing through large-scale land investments in agriculture. According to the coalition, the policies and investments fostered by the World Bank are designed to extract the maximum value from developing countries' natural and human resources, centralize wealth in a small corporate elite, and ultimately force targeted countries to follow a predetermined model of development, based on the neoliberal principles of privatization, deregulation, low corporate taxation, and free-market fundamentalism (Source: http://ourlandourbusiness.org/wp-content/uploads/2014/04/Joint-statement-Our-Land-Our-Business.pdf, retrieved 17.04.2015).

Is it possible to understand the *2.0 rhetoric* of the World Bank as a strategy to further pull small-scale farmers into global, deregulated markets and therefore into the lifestyle of the entrepreneur? Multinational corporations are increasingly recognizing the untapped potential market represented by the four billion people at the bottom of the economic pyramid, of which small-scale farmers are members (Hammond et al., 2007). According to a study that focuses on the growing usage of mobile phones for development in Africa, the acknowledgment of this segment of the population as a potential market represents an attitudinal shift on the part of multinational corporations (including manufacturers of mobile technologies and telecommunications services providers), who are now eager to expand their reach to include the poorest (Hosman, 2012). Thus, as I will attempt to discuss in the following section, many e-agriculture initiatives that appear as bottom-up programs aimed at the enhancement of agriculture in contexts of poverty may also be seen as corporate strategies that support the expansion of the telecommunications and other business sectors.[148] While this "top-down meets bottom-up" partnership may not be entirely undesirable, as it might potentially yield benefits for both sides, it may explain the great enthusiasm with which large corporations and economic organizations have embraced e-agriculture. This enthusiasm, in turn, holds the potential to overpower and dissolve the interests, needs, and aspirations of farmers (and thus their *voices*) by prioritizing those of the "top-down" players. However, it would be inaccurate and unfair to assume that all e-agriculture initiatives follow the same goals, values, and economic agendas as those stated in the sourcebook published by the World Bank. Therefore, in order to clarify this scenario, I will examine some of the most notable e-agriculture initiatives, chosen according to their recognition, impact, and sustained efforts over time. I exclusively chose to examine those initiatives aimed at delivering different kinds of agricultural information, and therefore left out other fields in which information and communications technologies

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148 I had the opportunity of attesting how e-agriculture served to further the economic interests of large public and private investors at the Information and Communications Technologies for Agriculture (ICT4AG) Conference, held in November 2013 in Kigali, Rwanda. Interesting debates about the strategies and possible impacts of e-agriculture took place at the conference, as well as explicit and even enthusiastic expressions of the business opportunities offered by e-agriculture. For instance, a member of GSMA, the international association that represents the interests of mobile operators worldwide, recognized the industry's "largely untapped opportunity for growth in rural areas." In a similar tone, Rwandan Minister of Agriculture Agnes Kalibata spoke in tune to the World Bank's vision about the "wealth" of those at the bottom of the economic pyramid and invited investors to regard it as a pool of economic opportunities to be exploited. In an article published before the conference, Mrs. Kalibata had already shared her vision of turning market-oriented, technologically augmented agriculture into the driver of Rwandan economy (Kalibata, 2013).

are applied to other aspects of agriculture, such as data collection or precision agriculture.[149]

4.2.1. Notable e-agriculture initiatives.

The following table (adapted from World Bank, 2011; USAID, 2011a) illustrates the range of information and communications technologies and services that are applied in e-agriculture projects. The availability, cost, penetration, and energy consumption may serve as parameters by which to determine the appropriateness of a service or technology in a specific context.

Service / Technology	Description	Availability	Cost	Penetration	Energy consumption
Voice	One-way or two-ways voice-based transmission of information.	- Radio (one-way) - Basic mobile phones - Smartphones	- Low (radio and basic mobile phones) - Medium[150] (smartphones)	- High (radio) - Medium (basic mobile phones)	- Low (radio) - Medium (basic mobile phones)
Short Message Service (SMS)	Text-based messaging limited to 160 characters.	- Basic mobile phones - Smartphones	Low - Medium[151]	- Medium (basic mobile phones) - Low[152] (smartphones)	- Medium (basic mobile phones) - High (smartphones[153])
Interactive Voice Response (IVR)	Computer programs that respond to the voice input of callers.	- Basic mobile phones - Smartphones	High[154]	- Medium (basic mobile phones) - Low (smartphones)	- Medium (basic mobile phones) - High (smartphones)
Internet access	Allows full-	- Smartphones	High[155]	Low[156]	High

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149 Precision agriculture is a technology-intensive agricultural methodology which aims at optimizing returns on inputs while preserving resources, by using GPS (Global Positioning System), GIS (Geographical Information System), remote sensing and data analysis applications (Chartuni et al., 2007).

150 As of 2013, the prices of smartphones were approaching those of high-end basic phones, but were still too expensive for farmers to purchase (Baumüller, 2013).

151 In 2011, the costs of sending SMS messages in African countries varied between less than 5 (Botswana) and just over 10 US cents (Cameroon). In that same year the cost of a single SMS message in Tanzania was comparatively low, with prices below 5 US cents. In Mexico, by contrast, the price of an SMS was about 10 US cents (World Bank, 2011). However, in order to fully determine the real costs of SMS messages, it would be necessary to contrast them with the per capita income in each country.

152 Smartphones accounted for around 19% of global mobile phone subscriptions in 2012 and were predicted to make up 50% of subscriptions by 2018 (Baumüller, 2013).

153 Basic mobile phones tend to have a longer battery life because of their limited features and low processing power. Smartphones require more energy due to the size and quality of the screen, data transfer through wireless connections, and processing requirements.

154 According to a survey, IVR was the least used information delivery service in e-agriculture due to the complexity and high costs of its implementation (Baumüller, 2013).

155 The International Telecommunications Union estimates that an entry-level mobile boradband plan amounts to 11.3 - 24.7% of the per capita gross national income in developing countries, with particularly high prices in Africa (ITU, 2013).

(mobile broadband)	fledged web access on mobile devices.				
Camera	Integrated in mobile devices, used to capture still or moving images.	- High-end basic mobile phones - Smartphones	Medium	Low - Medium	Low - Medium
Global Positioning System (GPS)	Integrated in mobile devices, used to collect location-based information.	- Smartphones	High	Low	High

Table 3. Information and communications technologies and services applied in e-agriculture projects. By Eugenio Tisselli (2015), adapted from (World Bank, 2011; USAID, 2011a)

A survey of development initiatives involving mobile phones found that 85% of services were targeted at basic phones, while just 33% were developed for smartphones (Baumüller, 2013).[157] Accordingly, 67% of these initiatives used SMS messages as a vehicle to deliver their services, while web and smartphone applications accounted for 34% and 24% respectively (Baumüller, 2013).[158]

In the following table, I will categorize a number of notable e-agriculture initiatives by the type of contents they deliver, the type of technologies they use, the organizations that support them, and the countries where they are active. I will also consider the role of farmers in each initiative, and whether it targets individuals or groups. These latter traits will later allow me to propose a value-based classification of e-agriculture initiatives. Since the beginning of this research in 2011, I have witnessed many e-agriculture projects being advertised, only to see them disappear shortly afterward. Consequently, I will present here only initiatives that have persisted over time and were still active at the time of writing. The full description of these e-agriculture initiatives may be found in Appendix B.

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156 While mobile broadband subscriptions more than doubled in developing countries from 2011 to 2013, they nevertheless represent about 20% of the population in those countries (ITU, 2013).

157 The overlap between these two figures stands for initiatives developed for both basic phones and smartphones (18%).

158 While building on existing systems may maximize the uptake and impact of e-agriculture initiatives by lowering the technological barrier for potential users, it could be argued that exploiting new technical possibilities might enhance those initiatives, allowing them to deal with richer, more complex information. This argument will be explored in the case studies included in this dissertation.

Initiative	Type of contents	Role of farmers regarding contents	Target	Technology	Organizations / Countries
The Organic Farmer Radio[159]	Agricultural information and training.	Producers / clients	Individuals / groups	Radio / SMS	Biovision Foundation[160] (Switzerland) / East Africa
Trac-FM[161]	General debate on public issues (including agriculture), polls and surveys.	Producers / clients	Individuals / groups	Radio / SMS	Farm Radio International[162] (The Netherlands, supported by the Bill and Melinda Gates Foundation)[163] / Uganda
Esoko[164]	Agricultural information and training, market information, advertisement, polls and surveys.	Clients	Individuals	SMS	Independent enterprise / Several countries in Africa
FarmerConnect[165]	Agricultural information and training.	Clients	Individuals	SMS	eSeal[166] (US) / Global
Farmerline[167]	Agricultural information and training, polls and surveys.	Clients	Individuals	SMS	Independent enterprise / Ghana
iCow[168]	Information and training on livestock farming.	Clients	Individuals	SMS	Independent enterprise (sponsored by USAID and Safaricom[169], among others) / Kenya
M-Farm[170]	Agricultural market information.	Clients	Individuals	SMS	Independent enterprise (supported by the World Bank, Samsung, among others) / Kenya
M-Shamba[171]	Agricultural	Clients	Individuals	SMS	Independent

159 The Organic Farmer: http://www.biovision.ch/fileadmin/pdf/e/projects/2013/International/FCP-Flyer_E_red.pdf (retrieved 05.05.2014)
160 Biovision Foundation: http://www.biovision.ch/en/biovision/who-we-are/ (retrieved 05.05.2014)
161 Trac-FM: https://www.tracfm.org/ (retrieved 05.05.2014)
162 Farm Radio International: http://www.farmradio.org/ (retrieved 05.05.2014)
163 The Bill and Melinda Gates Foundation: http://www.gatesfoundation.org/ (retrieved 07.05.2014)
164 Esoko: http://www.esoko.com (retrieved 06.05.2014)
165 FarmerConnect: http://farmerconnect.org/ (retrieved 06.05.2014)
166 eSeal: http://www.esealinc.com/ (retrieved 06.05.2014)
167 Farmerline: http://farmerline.org/ (retrieved 06.05.2014)
168 iCow: http://icow.co.ke/ (retrieved 07.05.2014)
169 Safaricom: http://www.safaricom.co.ke/ (retrieved 17.07.2014)
170 M-Farm: http://mfarm.co.ke/ (retrieved 07.05.2014)

	information and training, market information, advertisement.				enterprise (supported by local public institutions) / Kenya
Infonet-Biovision[172]	Agricultural information for extension workers and farmers.	Clients	Individuals / groups	Web[173]	Biovision Foundation (Switzerland) / Global
Rural eMarket[174]	Agricultural market information, advertisement.	Clients	Individuals / groups	Web	Farming and Technology for Africa[175] (Madagascar) / Africa
Totoagriculture[176]	Agricultural information for specialized call centers.	Clients	Individuals / groups	Web	INSEAD[177] (Europe, supported by the Bill and Melinda Gates Foundation) / Global
Access Agriculture / AgTube[178]	Agricultural training videos.	Producers / clients	Individuals / groups	Multimedia[179] / Web	Agro-Insight[180] (Belgium, supported by the Swiss Agency for Development and Cooperation)[181] / Global
Digital Green[182]	Agricultural videos on several topics, aimed at small-scale farmers.	Producers / clients	Individuals / groups	Multimedia / Web	NGO (India, supported by public and private organizations, such as Ministry of Rural Development of

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171 M-Shamba: http://www.mshamba.net/ (retrieved 07.05.2014)

172 Infonet-Biovision: http://www.infonet-biovision.org/ (retrieved 07.05.2014)

173 Web-based e-agriculture initiatives require users to connect to the Internet and may be accessed using computers or smartphones with a mobile broadband subscription. They are generally aimed at agricultural institutions, such as public agricultural extension service providers, rather than small-scale farmers.

174 Rural eMarket: http://etsena.net/ (retrieved 07.05.2014)

175 Farming and Technology for Africa: http://123fta.com/ (retrieved 07.05.2014)

176 Totoagriculture: http://www.totoagriculture.org/ (retrieved 07.05.2014)

177 INSEAD (Institut Européen d'Administration des Affaires): http://www.insead.edu/home/ (retrieved 07.05.2014)

178 Access Agriculture: http://www.accessagriculture.org/; Agtube: http://www.agtube.org/ (both retrieved 08.05.2014)

179 E-agriculture initiatives that use multimedia technologies and formats are generally aimed at delivering educational videos and animations to farmers. These contents are commonly produced using video cameras and viewed on TV sets or monitors equipped with DVD players. Even though computers and smartphones may also be used to produce and view these contents, they are rarely used in the context of e-agriculture. Therefore, the initiatives in this category rely on information and communications technologies only in an indirect way. However, these initiatives were included because some of them regard farmers not only as clients of expert information, but also as producers of content, and therefore may provide examples of how to reinforce reciprocal practices.

180 Agro-Insight: http://agroinsight.com/ (retrieved 17.07.2014)

181 Swiss Agency for Development and Cooperation: http://www.sdc.admin.ch/ (retrieved 08.05.2014)

182 Digital Green: http://www.digitalgreen.org/ (retrieved 08.05.2014)

					India, the Bill and Melinda Gates Foundation, AGRA, Google, Vodafone Foundation)[183] / India, Ghana, Ethiopia, Tanzania
Farming Instructor[184]	Agricultural information, discussions about related topics.	Producers / clients	Individuals	Multimedia / Mobile application	Independent enterprise / Tanzania

Table 4. Categorization of notable e-agriculture initiatives. By Eugenio Tisselli, 2015.

4.2.1.1. *Voice* and reciprocity in e-agriculture initiatives.

The e-agriculture initiatives reviewed here aim at improving a number of key factors in the livelihoods of small-scale farmers. These factors include agricultural knowledge and techniques, interacting with agricultural markets, managing biotic challenges such as pests or diseases, and abiotic challenges such as extreme weather events. But how can these information and communications technologies be used to strengthen the *reciprocal voice* of communities of small-scale farmers?

The following chart seeks to identify the extent to which the e-agriculture initiatives reviewed here might reinforce *voice* and *reciprocity* in rural farming communities. The fourteen projects included in the previous table are represented by letters A to N. The color of each letter shows whether a project provides market information (blue), information about agricultural practices (yellow) or both (green). The letters are arranged within a bi-dimensional space defined by two axes, which represent different qualitative magnitudes. The horizontal axis is the *voice* vector, and allows one to determine the extent to which a project considers farmers as clients of content and information (left) or as producers (right). The vertical axis is the *reciprocity* vector, which serves to differentiate projects addressed to individual farmers (top) from those addressed to groups of farmers (bottom).

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183 Vodafone Foundation: http://www.vodafone.com/content/index/about/foundation.html (retrieved 08.05.2014)
184 Farming Instructor: http://www.mvigour.com/FarmingInstructor.html (retrieved 08.05.2014)
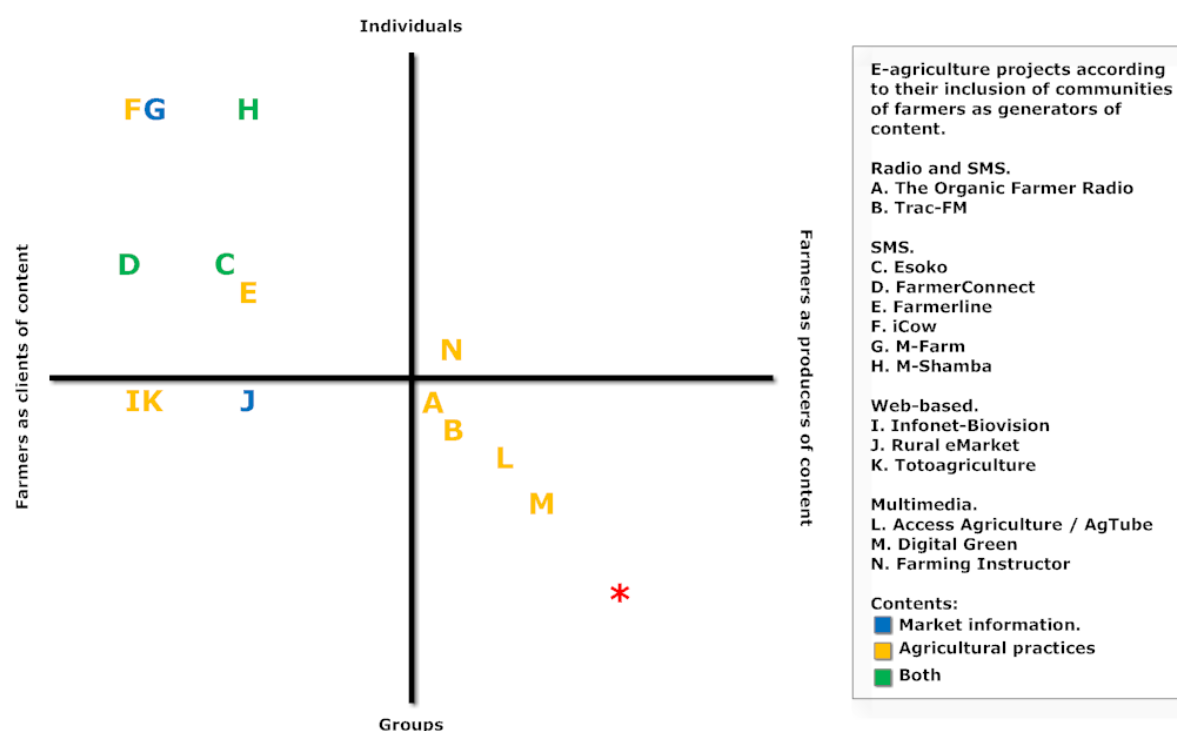
Chart 1. *Comparison chart of notable e-agriculture initiatives. By Eugenio Tisselli, 2015.*

The position of each letter does not reflect quantitative X and Y values along given scales, but rather a qualitative assessment of the project's potential to reinforce *voice* and reciprocity, based on each project's stated goals, methodologies, and contents. The chart reveals a number of observations that may help to determine whether a given e-agriculture project might contribute to amplify or attenuate the *voices* of farmers, and whether it might encourage collaboration or competition between individuals.

The projects that involve radio and SMS (A, B) and multimedia (L, M, N) tend to occupy the right side of the chart, while web-based (I, J, K) and SMS-based (C, D, E, F, G, H) projects occupy the left side. This distribution reflects the fact that radio/SMS and multimedia projects stress, to varying degrees, the participation of farmers in the creation of contents. Digital Green, for example, is located farther to the right that The Organic Farmer Radio because, while the latter limits the participation of farmers to responding to polls, the former incorporates a participatory process of content production in its model. Radio/SMS and multimedia projects also tend to occupy the lower side of the chart, which means that these

projects explicitly involve groups of farmers (rather than individual farmers) in the processes of production and reception of contents, and thus potentially encourage collaboration. Farming Instructor is the only exception, as it is conceived as a platform in which farmers may individually produce and receive contents through their smartphones.

Conversely, web-based and SMS-based projects tend to regard farmers as recipients of information, and are mostly aimed at individual users. Web-based projects are located below the horizontal axis, reflecting the fact that their contents are intended to be shared with groups of farmers through their dissemination by extension workers. Within this category, Rural eMarket is located farther to the right because it allows farmers to advertise their products and services besides consulting market prices, while Infonet-Biovision and Totoagriculture are closed platforms in which contents are created exclusively by experts. In SMS-based projects, individual farmers are considered as clients of information in varying degrees. Within this category, Farmerline contrasts with iCow and M-Farm. Whereas Farmerline provides a minor outlet for participation by allowing farmers to respond to surveys and, in its pilot phase, was used by farmers working together as a group, iCow and M-Farm follow a model in which unidirectional expert information is delivered to individual farmers. The fact that this chart locates e-agriculture projects that are purely based on mobile phones at its top-left sector is consistent with the argument that mobile phones tend to individualize information and communication in an unprecedented manner. However, because mobile phones may also be used as shared tools, this tendency may not be unavoidable, as I will attempt to discuss in chapter 5.

Moreover, even if the SMS-based e-agriculture initiatives reviewed here follow a unidirectional model of communication (from experts to farmers), mobile phones potentially enable multidirectional models of content dissemination. Mobile phones as shared tools and as means for the multidirectional flow of content are two of the key components of the ERV Methodology, as will become evident in the case studies in Tanzania and Mexico. For now, I have used a red asterisk to mark the potential position occupied by the ERV Methodology in the above chart.

I claim that e-agriculture initiatives that are located farther to the right of the matrix have a greater potential to amplify the *voices* of farmers than those located farther to the left. For example, an e-agriculture methodology that allows farmers to produce and disseminate their own contents may allow them to speak publicly about their desires, aspirations, and needs. Conversely, regarding farmers as clients of information may not only silence their *voice*, but effectively disempower them. As philosopher Ivan Illich suggested, unidirectional education provided by experts may discredit the indigenous, non-institutionalized knowledge of self-taught communities. Expert education tends to prompt its recipients into a dependency on contents validated by authorities, while weakening their motivation for learning independently via unfettered observation and participation within a meaningful context (Illich, 1971).

In the context of participatory approaches in agriculture, models in which information is merely transferred from experts to farmers have also been criticized on the basis that they offer a purely nominal form of participation, in contrast with consultative or collective decision making processes of participation in which farmers take active roles (Ashby, 1990). In contrast, programs within the field of agroecology, such as *De Campesino a Campesino* (*From Farmer to Farmer*) have successfully engaged small-scale farmers in the reciprocal transmission and collective construction of knowledge, practices, and methods by allowing them to "unleash their creativity in solving their own problems" and turning isolated "sustainable" techniques into complex agroecological systems (Holt-Giménez, 2006; Machín et al., 2013, p.23). The *De Campesino a Campesino Methodology* includes activities such as:

- Participatory diagnosis of issues and challenges that affect a small-scale farming community.

- Collective analysis and discussion of problems that need to be tackled.

- Systematization of the available information related to those problems, including photographs, drawings, maps, and narrations.

- Carrying out methodological workshops that emphasize the exchange of information and knowledge between farmers and seek to enhance their capacities for developing their own solutions.

- Conducting periodic evaluation meetings.
(Holt-Giménez, 2006)

This program tried to blend traditional knowledge and farmer innovation together with the science of agroecology and, according to an impact study, it stimulated the "rapid generation, diffusion, and adoption of agroecological practices at the farm level" (Machín et al., 2013, p.24).

An additional example of reciprocal exchange of knowledge between small-scale farmers may be found in the dialogic process known as *Diálogo de Saberes,*[185] a central constituent of the internal organization of *Vía Campesina*. *Diálogo de Saberes* is a "collective construction of emergent meanings based on dialog between people with different historically specific experiences, cosmovisions, and ways of knowing, particularly when faced with new collective challenges in a changing world" (Martínez-Torres, Rosset, 2014, p. 982). It is both a non-explicit, underlying process of discussion and an explicit methodology based on philosopher Paulo Freire's dialogic methods (Martínez-Torres, Rosset, 2014).[186] *Diálogo de Saberes* is closely related to the notion of *reciprocal voice*, since it is based on the peer-to-peer exchange of life histories and ways of knowing and engages small-scale farmers in collective exercises aimed at defining common problems and allowing complex notions and strategies to emerge (Martínez-Torres, Rosset, 2014). The notion of *food sovereignty*, for example, emerged from this process, as well as other forms of consensus between small-scale farmers and non-farmer actors who shared contested rural territories, such as nomadic pastoralists or indigenous people (Martínez-

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185 *Diálogo de Saberes* may be translated as *dialog among different knowledges and ways of knowing* (Martínez-Torres, Rosset, 2014).

186 The methodologies of Paulo Freire questioned the notion of *education*, understood by the philosopher as "an instrument which is used to facilitate integration of the younger generation into the logic of the present system and bring about conformity" (Freire, 2000, p. 34). As an alternative, Freire proposed dialogic methodologies that sought to merge the roles of *teacher* and *student*, in order to provide people with the means to "deal critically and creatively with reality and discover how to participate in the transformation of their world" (Freire, 2000, p. 34).

Torres, Rosset, 2014).

I suggest that e-agriculture initiatives may positively enrich their potential to encourage *reciprocal voice* by incorporating the lessons learned in methodologies and processes such as *De Campesino a Campesino* or *Diálogo de Saberes* into their values and practices. This may be achieved by shifting current models in e-agriculture towards more complex methodologies that enable reciprocal collaboration. However, by targeting individual farmers instead of groups, e-agriculture initiatives may directly or indirectly encourage competition instead of collaboration. As discussed, collaboration is often the enactment of reciprocity which, in turn, may be regarded as an alternative value to the pervasiveness of competition.

This overview of notable e-agriculture initiatives also reveals a diversity of supporting entities that may be public, private, or non-governmental. This convergence of interests is often manifested in cross-sector partnerships and suggests a shared, wide-ranging interest on the role of information and communications technologies in agriculture. Although I have attempted to differentiate initiatives that may strengthen *voice* and reciprocity from those that tend to encourage the values of individualism and competition—perhaps closer to those upheld by private corporations—there does not seem to be a significant correlation between sponsors and values.[187]

4.2.2. E-Agriculture initiatives in Latin America.

While most e-agriculture initiatives concentrate on Africa and Asia, Latin American countries have also been the scenario of projects in which information and communications technologies have been applied to improve the conditions of small-scale farmers. However, e-agriculture projects in Latin America seem to be less visible, and their reach, scope, and impact is apparently more limited. Why is it so? Studies point towards a number of technical, cultural, and policy barriers that have

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187 The fact that entities with large economic interests support e-agriculture initiatives regardless of their values may suggest the extent to which these entities are capable of assimilating different discourses while nevertheless furthering their own businesses.

weakened the potential of e-agriculture in the region:

- Connectivity in rural areas is limited,[188] and the cost of technologies remains too high for most farmers (Rodrigues, 2013). Although telecentres or commercial cyber cafes in rural contexts may compensate for low levels of household access, evidence has shown that farmers tend to be reluctant to visit telecentres, which often fail because of insufficient funding (Nagel, 2013).

- The usefulness of information and communications technologies in agriculture is often unclear to farmers (Rodrigues, 2013). Different countries in the region have developed mobile-based agricultural information systems; however, their practical value was very limited because farmers did not have the habit of using SMS messaging (Nagel, 2013).

- Farmers, especially older and less educated ones, tend to oppose the incorporation of new devices in their agricultural practices. Studies suggest that there is a strong correlation between Internet adoption and the number of years spent in an educational institution in rural Latin America (Rodrigues, 2013).

- In the region, there is a lack of state policies explicitly addressing e-agriculture as an area of interest. In a review of Latin American state policies from 2007 to 2013, only Colombia, Peru, and Uruguay explicitly contemplated the application of information and communications technologies to agriculture (Nagel, 2013).

- The lack of an effective bridge between web-based information platforms and small-scale farmers (Nagel, 2013). The interfaces of web-based platforms for e-agriculture tend not to be user-friendly, require user registration and password, and present poorly organized information (Nagel, 2013).

Despite the apparent shortage of e-agriculture initiatives in the region, a small

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188 In almost every Latin American country, with the exception of Uruguay, Costa Rica, Chile, and Mexico, less than 5% of rural households had access to the Internet (Rama, Wilkinson, 2013).

number of such projects exists. Most of these projects have been developed in the form of web-based services, with no direct outlets to radio, SMS, or other media accessible to farmers. Thus, it may be possible to largely describe e-agriculture initiatives in Latin America as information platforms that hardly reach farmers directly, much less including them as producers of content. Therefore, the capacity of those platforms to strengthen the values of *voice* and reciprocity may be unlikely. In Appendix B, a table that describes notable e-agriculture initiatives in Latin America may be found.

4.3. Potential risks of e-agriculture.

I will attempt to analyze a number of aspects related to the implementation of e-agriculture initiatives which, in the medium and long term, may actually present more risks than benefits to farmers. While some of these risks correspond to concrete questions, such as the money spent by farmers on e-agriculture services, those that are most relevant to this dissertation have to do with values that might limit or hamper *voice,* reciprocity, and political agency in rural communities.

4.3.1. Have the impacts of e-agriculture been overestimated?

In 2013, a joint research on the information needs and patterns of Kenyan small-scale farmers was carried out by the Multimedia University College of Kenya and the Zurich University of Applied Sciences. The research report provided a picture of farmers' access and use of various media channels, for both general and agricultural information. A survey conducted among 612 farmers revealed the dominant role of radio as the preferred media channel for receiving agricultural information, compared to the more marginal role of mobile phones (Spurk et al., 2013). Although two thirds of respondents had access to a mobile phone, only 21% preferred the phone as an information channel, contrasting with the 83% who preferred radio (Spurk et al., 2013). While these results may be specific to the populations living in the regions where the research was carried out,[189] the relatively

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189 The researchers who conducted this survey explained that the population sample was carefully created through a combination of personal contact with agricultural institutions and a random, multi-stage process of selection of individual farmers. The studied sample includes farmers from different agro-ecological zones, living in locations both

marginal usage of mobile phones suggests that the relevance of these tools in the context of small-scale agriculture might actually be overestimated, particularly by those who support e-agriculture. The survey also attempted to find out the opinions of the interviewees about the quality of agricultural information. The replies of farmers pointed towards an apparent gap between their information needs and what they got from various services. The surveys suggested that farmers did not like the top-down approach applied by many services, and instead preferred to be informed about various options for existing problems (Spurk et al., 2013). Furthermore, farmers expressed that they would rather receive information as a comprehensive package with sufficient explanation rather than isolated or decontextualized fragments and bits, as most SMS-based e-agriculture initiatives tend to do (Spurk et al., 2013). Only 7% of the interviewed farmers had received agricultural information via mobile phones, and even supposedly popular mobile-based e-agriculture initiatives in Kenya, such as M-Farm or iCow, were hardly mentioned by respondents (Spurk et al., 2013). This research may point to an important discrepancy between the widely publicized enthusiasm surrounding mobile-based e-agriculture and its actual usage.

While I did not conduct a similar survey in Tanzania or Mexico as part of this dissertation, my observations about the usage of information and communications technologies in the particular contexts where I carried out the case studies tend to agree with the findings of the study in Kenya. In Tanzania, for example, only the local coordinator of the case study had used an SMS-based e-agriculture service. This service, called TIGO Kilimo,[190] was provided to registered users by TIGO,[191] a multinational telecommunications company that offers its services locally. TIGO Kilimo delivered two different kinds of information to farmers: market prices and weather forecasts. When I asked the coordinator whether he used this service regularly or at all, he replied negatively and explained that it had many problems. He observed that the service was too slow to respond to queries, often taking more than 24 hours. Furthermore, according to the coordinator, market prices were outdated

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close to and far away from markets (Spurk et al., 2013). The survey is particularly relevant, as Kenya is one of the main focus countries for e-agriculture, and therefore may accurately represent the general needs and preferences of small-scale farmers in relation to information and communications technologies.

190 TIGO Kilimo: http://www.tigo.co.tz/value-added-services/tigo-kilimo (retrieved 18.07.2014)

191 TIGO Tanzania: http://www.tigo.co.tz/ (retrieved 18.07.2014)

and were limited to only a few crops in a few locations across Tanzania, among which his own region was missing. Similarly, the weather information offered was just a general, country-wide average temperature and rain forecast, and therefore was practically useless. Although these observations are anecdotal and may not be generalized, they suggest the possibility that some mobile-based e-agriculture services are not used because they are not as efficient as they claim to be or, in the worst cases, might actually be mere *baits* designed to sell services to small-scale farmers.

4.3.2. May e-agriculture contribute to further silence the *voices* of small-scale farmers?

Can e-agriculture initiatives that treat small-scale farmers only as clients of agricultural information contribute to the deepening of the silence in which their *voices* are submerged?

Going back to the survey on information needs and habits conducted among Kenyan farmers, a large gap between the provision of information through technological means and its accessibility was identified. The survey suggested that this gap might be related to education and income levels. In fact, radio was found to be the preferred channel by less educated farmers (Spurk et al., 2013), while evidence found elsewhere suggested that those who are wealthier and more educated are more likely to access and benefit from mobile-based services (Baumüller, 2012). Interestingly, the survey also revealed that many of the farmers claimed to lack even basic knowledge of good agricultural practice, and 80% of respondents expressed a strong need for basic agricultural knowledge (Spurk et al., 2013). The researchers who conducted this survey found this result rather surprising, as it contrasted with the understanding that African farmers have a traditional knowledge of basic agriculture and good agricultural practice (Spurk et al., 2013). While those who conducted the survey did not propose a possible explanation for this expressed lack of knowledge, it might be worthwhile to briefly reflect upon its possible causes, as they might be related to the erosion of the *voices* of farmers.

May the notion that African farmers are the holders of a rich body of traditional knowledge be not entirely correct or not generally applicable? Or could it be that the replies to the survey suggest that farmers tend to belittle their locally held knowledge, especially when it is contrasted with the knowledge of highly educated experts? The farmers' devaluing of their locally held knowledge might be a failure to properly judge what is valuable knowledge (and what is not), especially in the challenging conditions posed by anthropogenic climate change and unstable markets. However, it might also be due to a lack of confidence, related to the erosion of their *voices* in face of the hegemony of systems of agricultural knowledge based on scientific and technological expertise.

The social, economic, and environmental contexts in which traditional agricultural knowledge developed in Africa have suffered drastic historical transformations. In the past, for example, the abundance of available arable land might have compensated for soil degradation due to poor land management related to specific farming practices. However, present-day conditions related to growing population pressures and competition for land require new skills and knowledge that may radically differ from traditional ones. Environmental and political activist Wangari Maathai claimed, with respect to land and education, that policies in Africa have long neglected farmers by failing to address the inequities of land distribution left over from the colonial period and by insufficiently funding education in the form of agricultural extension services (Maathai, 2009). In general, the environmental and economic contexts in which small-scale farmers carry out their daily labor have become extremely unstable and, consequently, anything and everything is tried out: for example, new crops that may be more resilient to droughts, pests, or diseases, or that may produce more and sell at a better price; or new, more cost-effective farming inputs and techniques. Thus, the thirst for knowledge of African small-scale farmers might seem great.[192]

Moreover, as already suggested, the advance of neoliberalism in Africa seems to be rapidly gripping the imagination of small-scale farmers and drawing them into

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192 I observed this constant need for new knowledge during the case study in Tanzania and, as I will explain in chapter 5, it eventually became the project's main driving force.

markets, therefore creating a gap between traditional or locally adapted farming practices and the hegemonic narrative of production and competition in a globalized economy. Couldry suggested that gaps such as this one determine how certain forms of *voice*, particularly those disseminated by development experts, may work in detachment from the needs and interests of people like small-scale African farmers (Couldry, 2010). The detachment created through this process may be one of the contributing factors that compel these farmers to adopt the neoliberal narrative of the *entrepreneur* and therefore constantly seek more efficient and productive agricultural practices. Therefore, the hegemony of expert knowledge and productivity-driven agriculture may be contributing to the loss of legitimacy of traditional or locally adapted knowledge within the contexts in which it was generated. This might be a possible explanation of why the Kenyan farmers who participated in the survey expressed that they lacked even basic knowledge about agriculture. However, it is not possible to assume that the progressive invalidation of local knowledge under the influence of a hegemonic worldview is a sufficient explanation, as there might be other factors influencing the apparent alienation of small-scale farmers with respect to their traditional agricultural knowledge and practice. Nevertheless, the traction of this specific process of invalidation is a significant force, and therefore I claim that strengthening the value of *reciprocal voice* in small-scale farming communities might become an important factor to favor not only a public reappraisal of their knowledge, but also an internal one. Within a process of internal reappraisal, *reciprocal voice* might be tapped as a strategy to help farmers strengthen their confidence on the potentials of their communally held knowledge for developing situated and sustainable agricultural practices, while encouraging its progressive enrichment through an harmonic interaction with expert knowledge.

4.3.3. May e-agriculture compromise learning processes?

The industrialization of agriculture may be considered as a gradual and progressive process of invalidation of the culture, values, and knowledge of communities of small-scale farmers worldwide. As argued, small-scale farmers may possess complex forms of communal agricultural knowledge, yet the rapidly shifting

conditions of markets, climate, and other factors raise the need for a continued learning of new practices and techniques. However, continuous learning may be compromised by the *solutionism* of many e-agriculture initiatives, which seek to achieve quick effects in order to bypass slower, more complex processes. Learning takes time and, in rural contexts, involves observation and a deep understanding of the local ecology, as well as the management of multiple interactions between farming communities and institutions. Learning also requires communities to agree on a clear vision of what their future should look like, so that they can enhance their capacities to build it together. *Voice* is one of these capacities, as it allows communities of farmers to reach agreements and communicate with local authorities and other providers of resources, services, and support.

The importance of learning has been recognized and applied to methodologies in different agricultural contexts, such as farmer participatory research (Ashby, 1990) or the learning approach in agroecosystems management (Lightfoot et al., 2001). However, learning is costly and involves gradual iterations that may prevent the emergence of the type of quick, tangible results often demanded by those who fund it (Lightfoot et al., 2011). As a consequence, the *solutionist* effects of many e-agriculture initiatives may be favored by public and private institutions as a way to achieve quick goals while circumventing the potentially slow and costly creation of opportunities for in-depth learning. Although a number of e-agriculture services, particularly those based on radio and video, may valuably contribute to the creation of such opportunities, I argue that this may not be the case for those based on mobile platforms. Services such as iCow, for instance, may effectively *leapfrog* basic learning about cattle keeping by delivering automated instructions that farmers must follow in order to properly tend their cows. As indicated by impact studies, iCow can effectively help farmers raise the milk production of their cows.[193] But at what cost? Rather than encouraging farmers to establish a deep and sensible understanding of their cows through learning and observation, they are prompted to execute commands that appear on the screens of their mobile phones. And what happens when the service is suspended? What will farmers be left with? Other mobile-based e-agriculture initiatives tend to reproduce this pattern. Thus, by leapfrogging the

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193 iCow impact study: http://icow.co.ke/blog/item/15-icow-impact-study-results.html (retrieved 07.05.2014)

process of learning and considering farmers as passive recipients of information, the *solutionist* values and practices that largely prevail in e-agriculture may effectively compromise the capacity of *voice* for socializing knowledge and engaging in reciprocal learning processes.

4.3.4. May e-agriculture contribute to erode reciprocal practices?

What is at stake in small-scale agriculture is not only the capacity to learn about new knowledge, but also the very nature of that knowledge. What purposes may learning serve? Can learning reinforce the practice of reciprocity and the notion of *commons* or, contrastingly, establish a merely utilitarian and competitive view of agriculture? A number of e-agriculture initiatives reviewed here favor the delivery of market-ready, productivity-oriented information to individual farmers.[194] Therefore, it is possible to say that, willingly or unwillingly, the model of information and knowledge transfer of such initiatives may contribute to the disintegration of reciprocal values, in which agricultural production tends to address mutual benefits, rather than individual profits. A consequence of such disintegration might be the potential risk of intensifying the process by which small-scale farmers are pulled towards monetized models of labor and production, which might compromise their local forms of social and economic organization in ways that may be unwanted.

As farmers are compelled to enter deregulated global markets, they may also be at risk of entering spiraling forms of economic dependency. Technologies introduced by agricultural revolutions, such as chemical fertilizers, pesticides, genetically modified seeds, or mobile phones, may introduce previously nonexistent forms of dependency. In the case of mobile phones, farmers may find themselves facing a new or increased need for electricity, devices, and, more significantly, access to mobile networks. The regular payment required to access such networks may

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194 Within the sphere of information and communications technologies, initiatives that value and communicate traditional ecological knowledge are practically nonexistent. One notable exception, which nevertheless has gone largely unnoticed within e-agriculture, is the Traditional Ecological Knowledge Prior Art Database (TEK*PAD), "an index and search engine of existing Internet-based, public domain documentation concerning indigenous knowledge and plant species uses." TEK*PAD was developed by the American Association for the Advancement of Science. Although collecting traditional ecological knowledge into an accessible web service may potentially benefit small-scale farmers by preserving and communicating their knowledge, TEK*PAD is aimed to be used by scientists and seekers of patents, and may thus fall back into the domain of hegemonic interests. http://ip.aaas.org/tekindex.nsf/TEKPAD?OpenFrameSet (retrieved 28.07.2014)

potentially become a serious burden for farmers in the long run. If small-scale farmers become dependent on information delivered through mobile phones, they may be constrained to find ways of continuously paying associated costs. Such dependency might be understood as a closed loop: farmers are served with information specially tailored to boost their productivity and access to markets so that they may become reliable clients of all sorts of products, including information delivery. In hybrid social scenarios, where reciprocal economies coexist with monetized ones, raising their income through increased productivity can certainly be a legitimate goal for small-scale farmers. But does e-agriculture offer a sustainable model for achieving that goal? A report commissioned by the World Bank suggests that the poorer Kenyans are already overspending on mobile costs and even making monetary sacrifices that include foregoing food and transport (World Bank, 2012b). The report states that "these substitutions were largely undertaken in order to strengthen the longer-term asset accumulation of micro-enterprises" (World Bank, 2012b, p.39), meaning that access to mobile communications, including e-agriculture services and applications, may be currently seen by small-scale farmers as ways to increase their future income opportunities. However, those future opportunities, which may or may not materialize, already imply compromising basic subsistence. Such a scenario may be sufficient to bring the model of the small-scale farmer as a mobile-driven entrepreneur into question.

Monetized loops and spirals may marginalize reciprocity even further by invalidating alternative economic models, such as sharing or exchange. The loop of which e-agriculture initiatives are part of has a strong tendency to individualize economic actors, detaching them from the possibility of more communal forms. Although small-scale farming communities may be considered as hybrid contexts, as I have argued, their members tend to be more collaborators than competitors. Therefore, knowledge and information are needed not by individuals but rather by the community as a whole, who needs to make collective decisions. Social scientist Michael Gurstein, who proposed the notion of *community informatics*,[195] argued that

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195 According to Michael Gurstein, community informatics is "a technology strategy or discipline which links economic and social development efforts at the community level with emerging opportunities in such areas as electronic commerce, community and civic networks and telecentres, electronic democracy and online participation, self-help and virtual health communities, advocacy, cultural enhancement, and others" (Gurstein, 2000, p.1).

in such communal contexts, the conventionally and technologically prescribed mode of one-to-one communications offered by mobile phones may be potentially destructive of the very basis of communal life (Gurstein, 2012). Providing access to information on an individual level, as most mobile-driven e-agriculture initiatives do, may empower individuals. However, Gurstein claimed that it is not clear how individual empowerment may result in communal benefits, since it is most likely that this process would impede collaboration by introducing individual competition (Gurstein, 2012).

4.3.5. May the model offered by e-agriculture affect the political agency of small-scale farmers?

As argued here, the model offered by many e-agriculture initiatives tends to reproduce *solutionist* practices and values. *Solutionism* bypasses the complexities of political negotiation and misses the fact that the "how" of politics is as important as its "what," and that the former often shapes the latter (Morozov, 2014). Morozov claimed that *solutionism* weakens the people's ability to question the "how" of politics and speaks of an "algorithmic regulation," a sort of automated technocracy that may result in a political regime where technological corporations "call all the shots" (Morozov, 2014). However, as I have attempted to show, *solutionism* works in tandem with economic interests, so the ultimate purpose of algorithmic regulation might be, besides the subjection of the political sphere to technocratic values and ideals, a step further in the transformation of all human activity into a process of profit-making. Such processes may result in an all-encompassing commodification in which, as economist Raj Patel eloquently put it, everything has a price but nothing has a value (Patel, 2010). However, an additional effect of pervasive commodification is the limiting of political agency, as communities are fragmented into competing individuals for whom collective negotiation about a *commons* is no longer relevant or even possible. I claim that the prevailing models in e-agriculture present a high risk of limiting political agency, as they tend to silence the voices of farmers, erode reciprocal practices, implement *solutionist* schemes and strategies, and outsource government tasks and responsibilities into the hands of private corporations which, in turn, are "crowdsourced" to farmers. Crowdsourcing has been defined as "the act

of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people" (Howe, 2006). In social contexts with high levels of Internet access, crowdsourcing has thrived thanks to a docile yet interactive culture designed to participate in the reproduction of existent power dynamics, such as the social networks of Web 2.0 (Tewksbury, 2012). Thus, crowdsourcing does not operate through coercion, but rather by an individual internalization of the responsibilities that traditionally rested in the hands of public or private institutions. Potentially, e-agriculture may favor such a process, in which each isolated small-scale farmer would ultimately become the sole person responsible for the quality of his or her own livelihood. In other words, small-scale farmers may be left to their own devices.

4.4. Conclusions.

In this chapter, I have offered a broad and critical vision of the field of e-agriculture. Although I have identified areas in which e-agriculture may potentially benefit small-scale farmers, I claim that, because of the values and practices largely prevalent in the field, such benefits might turn into potential risks in the short, mid, and long terms. Such potential risks might include:

- Further silencing the *voices* of small-scale farmers by favoring a model that tends to regard farmers as mere clients of agricultural information. A consequence of this model might be a deepening of the effects that the lack of confidence in their own traditional systems of knowledge has brought to communities of small-scale farmers. These effects include marginalization and a disadvantageous interaction with other systems of knowledge, such as those applied in mainstream, industrial agriculture.

- Compromising the learning processes through which small-scale farming communities may internally exchange their traditional forms of knowledge, or acquire and apply knowledge and techniques coming from external sources. This risk is closely related to the *solutionist* values that are implicit in many e-agriculture initiatives and that tend to prefer quick, concrete effects rather than engaging in

slower, more complex processes of learning.

- Eroding the reciprocal practices that might persist within small-scale farming communities. Many e-agriculture initiatives tend to deliver market-ready, productivity-oriented information to individual farmers, thus implicitly negating more reciprocal forms of production, organization, and economic exchange. This risk, in turn, may compromise social and environmental practices that, because of their inherent reciprocity, may safeguard sustainability (regeneration and ecological services) and resilience (collaboration). Such practices might, in the mid- and long terms, be discarded by farmers in favor of those that emphasize productivity and economic competition and, consequently, could potentially deepen the environmental and economic challenges that already affect them.

- Creating new forms of dependency on potentially expensive inputs, such as electricity, mobile phones, and, most significantly, costs related to telecommunications services.

- Producing a molecularization of the sphere of politics, in which the tasks and responsibilities of governments might be crowdsourced to small-scale farmers.

Some of the benefits that e-agriculture might bring to small-scale farmers (especially those living in hybrid social and economic scenarios), such as increasing productivity thanks to knowledge and practices transmitted from experts to farmers, or raising income levels, may be important factors that can improve their livelihoods. However, I claim that e-agriculture initiatives might be judged not only by their concrete results, but also by their implicit values and worldviews.

I have also addressed the question of whether the impacts of e-agriculture have been overstated, particularly by those organizations that might regard the field as a source of economic benefit. It might be too soon to answer this question, as e-agriculture is still an emerging field. But, rather than attempting to find an answer, and despite the largely critical outlook I have chosen to adopt in this chapter, I posit that e-agriculture may play a positive role in the future of agriculture. If carefully

contextualized, information and communications technologies might significantly contribute to achieve a paradigm shift in agricultural knowledge, science, and technology, as demanded by the IAASTD Report (IAASTD, 2009a). Furthermore, e-agriculture may potentially encourage the exchange of *reciprocal voice* in small-scale farming communities as well. Perhaps reciprocal processes such as *De Campesino a Campesino* or *Diálogo de Saberes* could be augmented through the application of information and communications technologies. I propose that e-agriculture could positively enhance methodologies that address the multifunctionality of agriculture (a feature that has been identified in the IAASTD report, and also within agroecology) by rethinking some of its core values and adopting alternative strategies, like the ERV Methodology.

In the next chapter, I will present the ERV Methodology and will discuss how it was developed after the case study in Tanzania and subsequently applied to the case study in Mexico. By doing so, I will attempt to argue that applying alternative, value-based strategies in e-agriculture is possible and, if conducted carefully and respectfully, might yield positive outcomes in small-scale farming communities.

Chapter 5: The ERV Methodology and the Case Studies in Tanzania and Mexico.

Introduction.

In this chapter I will describe the ERV Methodology, which constitutes the methodological foundation of the case studies presented in this dissertation. This methodology, which involves an extensive usage of mobile phones and the Internet, seeks to strengthen *reciprocal voice* in the context of communities at risk of social exclusion, such as subsistence farming communities. I derived the technological and social components of this methodology partly from the informal practices of the Megafone project, with the aim of reinforcing its potentials and overcoming its flaws. The possibility of engaging a small group of people in the collaborative, peer-to-peer creation of a common base of audiovisual content using mobile phones and the Internet was already present in Megafone. However, I claim that the potential of this process, which was carried out informally, was enhanced precisely by formalizing it as the ERV Methodology.

The ERV Methodology was designed to be applied when working with small groups of people and combines the usage of technologies for online communication with face-to-face interaction. It resonates with the principles of *organized networks* to the extent that the methodology aims to establish small-scale groups, enable horizontal encounters in physical space, and activate *online* collaboration through a transformative understanding of information and communications technologies. Moreover, the ERV Methodology agrees with certain aspects of participatory methodologies in agroecology, such as *De Campesino a Campesino*, described in chapter 4.

I will describe and analyze how the ERV Methodology was formalized following my experience in the first practical case study, and fully applied in the second one. I initiated the first case study, *Sauti ya wakulima*, in Bagamoyo, Tanzania, in January 2011, and, at the time of this writing, it was still active. In

contrast, the second case study, *Los ojos de la milpa*, which I carried out in Oaxaca, Mexico, started on January 2012 and only lasted one year. I will attempt to illustrate how these case studies both informed and enriched the ERV Methodology and how they sought to encourage *reciprocal voice* through the transformation of the embedded values and modes of usage of information and communications technologies. In contrast with the solution-centered approach taken by practically all e-agriculture initiatives reviewed in chapter 4, the case studies presented here do not seek to solve particular problems related to small-scale farming, but rather attempt to create an appropriable sociotechnical environment for *reciprocal voice*. The purpose of both *Sauti ya wakulima* and *Los ojos de la milpa* was to activate the flow of the knowledge *commons* within small groups of subsistence farmers and their larger communities.

I will discuss each case study, describing how their development corresponded to the different steps of the ERV Methodology. In turn, I will explain how the particularities of each case study prompted me to contextualize and adapt the methodology accordingly. Finally, the outcomes of each case study will be analyzed by following qualitative methods that adhere, to a certain extent, to key principles of visual anthropology. The application of these principles to the analysis of the messages posted by farmers allowed me to derive and apply a *tag-based* analysis that contributed to understanding the purposes and meanings generated by the participants through their *voices* and actions, and therefore to determine the extent to which the case studies were successful or not.

5.1. The ERV Methodology.

In the following paragraphs I will describe the methodology I have developed to create enabling environments for *reciprocal voice* through a transformative usage of mobile phones and the Internet. Considering that the modes of communication enabled by digital communications technologies may have contributed to the devaluing of *voice*, and that the values inscribed in those technologies correspond to individual self-interest, as discussed in chapter 2, strengthening reciprocity with mobile phones and the Internet might seem a paradoxical endeavor. However, the

ERV Methodology puts forward that resistance against the erosion of *voice* and individualistic communication can be actively exercised as a critique from within contemporary technological culture.

The ERV Methodology was developed and applied within the contexts of artistic intervention and *cross-community research* in rural settings. The complexity of such contexts poses the necessity of continuous adaptation, and therefore it might be argued that a fixed methodology might prevent a certain degree of improvisation. However, I have formalized the ERV Methodology as an open-ended set of guidelines, presented here with the purpose of making them available for their application and further refinement.

The main purposes of the ERV Methodology are threefold:

1. Help a group establish a shared communicational praxis through which the *voices* of its members can be heard.

2. Enable the collaborative production of a knowledge *commons*.

3. Strengthen reciprocal relations within the group and, potentially, with other members of its social context.

The ERV Methodology was specifically designed to be applied in interventions involving groups at risk of social exclusion and seeks to help people who belong to those groups or communities to project their *voices* and broadly express their views, aspirations, and needs. Because the modes of communication that digital networks offer may turn the expression of *voice* into mere self-communication, the ERV methodology seeks to carry out a guided dissemination so that *voices* can find their desired listeners. Concretely, the methodology was designed to function as an interface between different domains of *voice*. It does not seek to orient the *voices* of those involved in a particular direction, but rather to help them develop an autonomous dialogue within an open-ended sociotechnical setting that seeks to strengthen reciprocity.

In order to achieve its purposes, the ERV Methodology seeks to transform the modes of usage of the communications technologies involved in it. It attempts to strengthen reciprocity by rewriting the individualistic values inscribed in mobile phones and transforming them into communal, shared devices. Nevertheless, a particular technology cannot be understood in isolation from the social context in which it performs its functions. Therefore, the ERV Methodology seeks to shape a small-scale sociotechnical system by transforming the values inscribed in mobile phones and the Internet and reinterpreting their usage according to locally observed reciprocal behaviors and social relations.

5.1.1. Technological components of the ERV Methodology: the *ojoVoz* software platform.[196]

5.1.1.1. The *ojoVoz* mobile app.

Smartphones are the key technological component of the ERV Methodology. They allow those who take part in the methodology to send messages to a shared web-based platform. These messages are composed using a mobile app for the Android[197] operating system that I specifically developed for that purpose. The mobile app allows participants to easily compose and send *messages*. It is important to note that, within the scope of the ERV Methodology, *messages* are a combination of the following elements:

- A picture taken with the smartphone's camera.
- A voice clip recorded with the smartphone's microphone.
- A keyword, or *tag*, chosen from a list or typed using the smartphone's keyboard.

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196 A detailed description of the the technological components of the ERV Methodology, also known as the *ojoVoz* ("eyeVoice") software platform, may be found in Appendix A.

197 Android is a mobile operating system based on Linux and developed by Google. Before developing the mobile app, I had worked with Nokia mobile phones throughout the Megafone project. The reason why I decided to move from Nokia phones, based on the Symbian operating system, to Android phones, was the impressive expansion of the new system and the corresponding decline of Symbian. The market share of Symbian fell from 16.84% in 2009 to 6.58% in 2011, while Android grew from 2.59% to 15.31% in the same period. The iPhone operating system also increased its market share from 2009 to 2011; however, iPhones were too expensive for me to consider. Source: http://www.netmarketshare.com/ (retreieved 10.11.2014)

- A geographical location that corresponds to the place where the message was composed. This location consists of latitude and longitude values, obtained automatically by the smartphone's built-in GPS.

Once a message has been composed, the app allows participants to send it to a shared web platform immediately or at a later time.

The *ojoVoz* mobile app is roughly based on the smartphone application used throughout the Megafone project and follows the same principle of simplifying the process of composing and publishing audiovisual messages. However, the mobile app was also designed with the intention of overcoming certain limitations of the Megafone application, namely by introducing the capability of functioning in contexts with little or no Internet connectivity.

5.1.1.2. The *ojoVoz* web platform.

The messages composed and published using the mobile app can be browsed on a web-based platform which, by default, is openly accessible to the public.[198] This platform allows users to browse through messages under different criteria: date, keyword, geographical location, or a combination of these filters. The web platform also allows users to comment and provide feedback to published messages. Registered users may edit and delete messages and perform general housekeeping tasks.

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198 If required, the web platform may be protected with a password to limit and control access.

5.1.2. Social and organizational components of the ERV Methodology.

The following table presents the social and organizational components of the ERV Methodology as a series of sequential steps, which I will describe as generically as possible. However, as I present the case studies, I hope to illustrate how each step must be adapted to fit the local context.

Methods	Principles and Processes
1. Identifying a community at risk.	Choose a risk-generating issue within the community that is specifically and clearly identifiable. The concrete effects of this issue have to be mindfully and explicitly felt by the community.
2. On-the-ground research and interviews.	Conducting on-the-ground research of the community's concrete settings and interviewing its members allows for the assessment of the challenges they face. On-the-ground research aims to: - Detect observable, concrete features of the risk-generating issue. - Determine the technological scenario in the community, and therefore the technical feasibility of the methodology. It is essential to find available wireless connectivity (WiFi or mobile broadband) within reasonable distance. - Determine the community's general level of familiarity with technologies such as the Internet or mobile phones. The interviews will be aimed at answering questions such as: - How do the challenges faced by the community manifest themselves in daily life? - How do the members of the community perceive these challenges? - What are their main concerns related (directly or indirectly) to these challenges? - Are they interested in *voicing out* about their concerns? If so, who would be their desired listeners? - Achieve familiarity with members of the community.
3. Gathering the community, explaining the methodology, and seeking participation.	Initial meeting: - Hold an initial meeting, gathering as many members of the community as possible, with the aim of explaining the methodology to everybody. - Participation: Invite the community as a whole, even those people who will not participate directly in the methodology. The invitation can be

	stated in clear and simple terms: "would you like to use mobile phones and the Internet to express your views and opinions about ... ?" Answer the questions posed by the community as thoroughly as possible. It is very important to make sure that the purposes of the methodology, the ownership of its contents and methods, and the potential benefits and dangers posed by the offered technologies are clearly understood by all. Give the community enough time after the meeting to deliberate and decide whether they want to take part or not, and under what conditions. Separate meetings with local authorities might be necessary in order to raise interest and request support.
4. Choosing a group of participants.	The community decides which of its members will directly participate in the subsequent processes of the methodology. Gender balance will be encouraged. The choice of participants may vary, according to criteria determined by the group. Their number may be constrained by practical criteria, including: - Manageability of the group. - Availability of space for face-to-face meetings. - Number of smartphones offered. A crucial aspect of the methodology is that there should always be more participants than smartphones, so that devices can be shared and rotated reciprocally.
5. Agreeing on common topics.	Agree with the participants on a list of common topics that become keywords. These keywords will serve to describe the issues affecting the community and will also be fed into the mobile app so that participants can choose them from a list. The list of keywords will be just a starting point, as it may be expanded at any time during the course of the methodology. The common keywords signify the concerns of the participants and might undergo transformation as events develop. The malleable keyword-based definition seeks to combine common concerns with open-ended needs and interests. This approach attempts to leave enough space for the participants to claim ownership of the methodology and treat common challenges through an open, *cross-community* perspective.
6. Identifying and training a local coordinator.	Ideally, the local coordinator is a person who: - Is a member of the community - Everybody knows and trusts - Is highly familiar with the issues affecting the community. - Has acceptable skills related to the usage of mobile phones and computers. - Can communicate fluidly with the research team. The coordinator will make sure that the local processes of the methodology function properly. He or she will:

	- Receive in-depth technical training, so she can train others. - Coordinate face-to-face meetings and facilitate discussion among participants. - Make sure that the smartphones are used and shared properly, and that everybody has equal chances to use them. - Report problems or issues to the research team.
7. Delivering the smartphones and carrying out training sessions.	The smartphones are delivered to the local coordinator, who will manage them and make sure they are used properly. In case there are no available computers for the participants to browse the messages they have published, one or more computers with mobile broadband connection may also be provided. Sufficient training sessions are carried out so that every participant has a clear understanding of how the mobile app and the web-based platform work.
8. Agreeing on a schedule for face-to-face meetings.	The participants and the coordinator agree on a schedule for periodic meetings, which will ideally take place every week. In these meetings, participants will: - Browse and discuss messages recently published online. - Share the available smartphones with other participants. Additionally, the coordinator will make sure that those who will use smartphones until the next meeting have understood how they work and what topics need to be documented with them. Specific techniques for documentation, such as interviews or surveys, may arise from collective discussion during face-to-face meetings. During these meetings, new topics for documentation may also emerge.
9. Interaction with experts and authorities, and dissemination to the general public.	After the group has published a significant body of content, the processes of interaction with other communities and dissemination may start. Interaction begins by reaching people or organizations marked by the community as "desired listeners." These listeners may be experts (scientists or technicians) who may provide assistance on specific issues, or local authorities who may intervene politically. The web-based platform may be presented to experts and authorities as a valuable source of on-the-ground information and knowledge that may inform their technical, scientific, or policy-making tasks. Interaction may also be an invitation to listeners to become engaged and respond, whether directly or by making comments on the web-based platform, about the concerns and demands expressed by the group. If the community agrees, the web-based documentation may also be disseminated among a broader, general public.
10. Conducting evaluation meetings.	Regularly scheduled evaluation meetings allow the research team to meet and discuss the methodology with the participants and the local coordinator.

	During the meetings, the research team may interview participants and identify possible issues and shifts in the course of the methodology. Ideally, the research team will constantly gauge the interest of participants and, if necessary, introduce adaptive changes in the methodology.
	Evaluation meetings allow the research team to assess whether the methodology effectively addresses the common concerns initially agreed upon by the community and the extent to which participants have appropriated and reshaped it.
	Whenever it becomes necessary or pertinent, the reach of the methodology may be scaled up to include additional groups of participants, who may establish a parallel, independent methodology and may communicate with the other groups using the web-based platform and, if possible, face-to-face.

Table 5. Social and organizational components of the ERV Methodology. By Eugenio Tisselli, 2015.
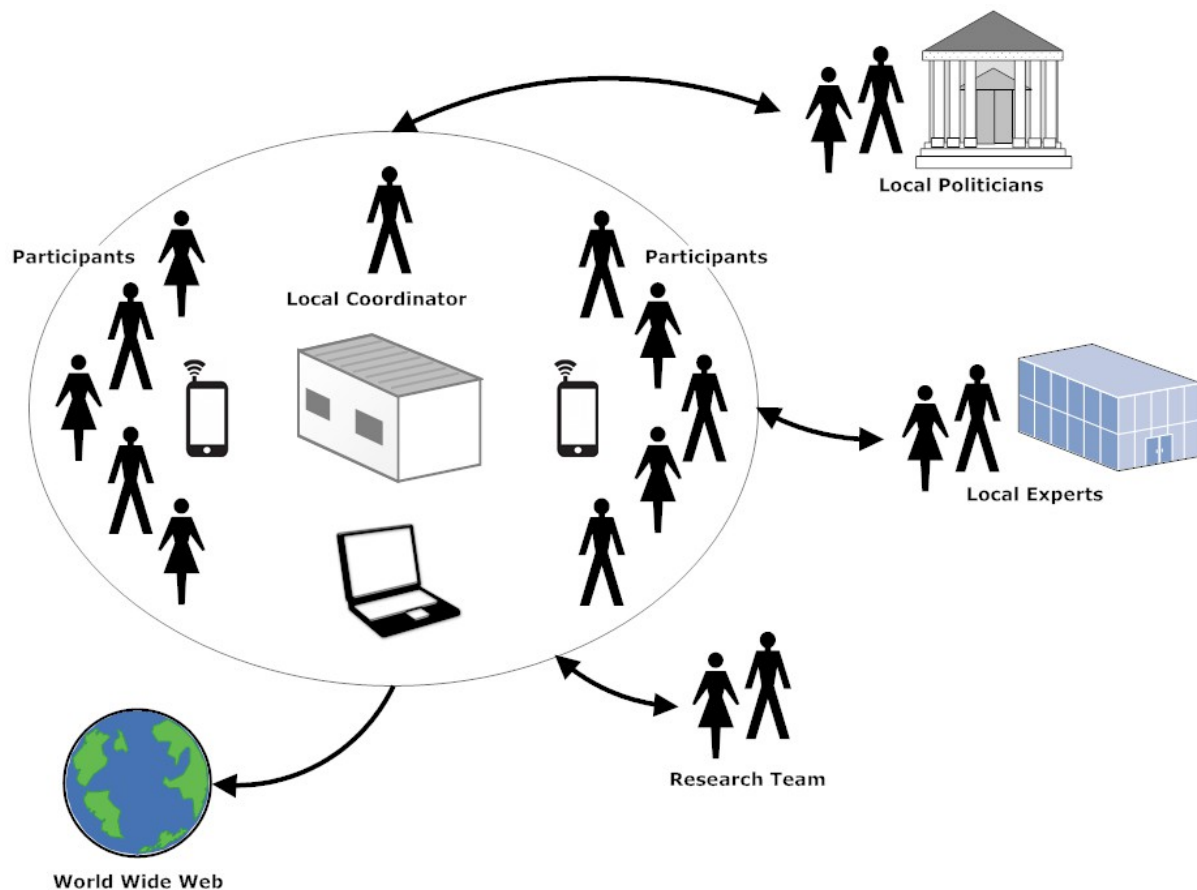
Diagram 2. The communities, technological elements and interactions of the ERV Methodology. By Eugenio Tisselli, 2015.

To summarize, the ERV Methodology seeks to encourage the reciprocal exchange of *voice* in four distinct ways:

1. Online messages published through the *ojoVoz* software platform. These messages, which consist of photographic images (a spatial medium) and sound clips (a temporal medium) are considered as *voice* because they conform a spatio-temporal object whose richness may be used to give an account of a fragment of the surrounding world.

2. Potential encounters with non-participating members of the community through the activity of capturing messages with the *ojoVoz* mobile app, particularly when those messages follow the format of an interview.[199]

3. Face-to-face discussions at meetings, in which the participants of the methodology are regularly engaged.

4. Dialogues with members of other communities, such as scientists or policy-makers.

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199 Ariella Azoulay, a prominent theorist of photography and visual culture, argued that photography could be understood as the product of an encounter, namely the photographer and the photographed (Azoulay, 2008). According to Azoulay, such encounters transcend the inside vs. outside dichotomy present in discussions about photography by framing the act of taking a picture as a dialogic interaction (Azoulay, 2008). Because photographs are a key element of the messages composed using the *ojoVoz* mobile app, those messages may be analyzed as evidences of social encounters when the photographed subject is a person.

5.2. *Sauti ya wakulima.*

5.2.1. Justification.

The case study in Tanzania was made possible thanks to seed funding granted by the North South Centre[200] of the Swiss Federal Institute of Technology. The proposal on which the funding was based identified three objectives:

1. To investigate communication of climate change adaptation measures in farming communities in Tanzania.

2. To study the role of indigenous knowledge as scientifically relevant data.

3. To explore the possibility of using information and communications technologies to mediate in the process of research.

The background for the first and second objectives, which were very closely linked, was prompted by a recognition coming from the fields of climate science and development that stated the need to emphasize farmer participatory research. As discussed in chapter 3, farmer participatory research may go beyond merely calling upon farmers to set research agendas for formal agricultural research by also involving them in the creation of strategies, criteria, evaluation, and control of the research itself (Ashby, 1990; Bentley, 1994). In the context of anthropogenic climate change, climate scientists have recognized the need to carry out farmer participatory research beyond nominal participation, by valuing and integrating traditional ecological knowledge and other forms of locally held knowledge (Jones, Thornton, 2003). Integrating diverse systems of knowledge may become a particularly significant task in the design of local adaptation strategies: since response to climate change is variable from place to place, it is not possible to make overarching recommendations, so the best approach might be a participatory one (Jones, Thornton, 2003). The two first objectives of the proposal presented to the North

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200 The North South Centre of the Swiss Federal Institute of Technology: http://www.northsouth.ethz.ch/ (retrieved 23.10.2014)

South Centre contemplated the *cross-community* interaction between scientific and traditional farmer-held knowledge and focused on communication. These objectives, in turn, were based on recommendations to extend educational services and to disseminate information on climate change in order to sustain adaptation strategies (Jones et al., 2005).

The third objective was based specifically on my previous experience in the Megafone project, and therefore entailed my active participation. The purpose of using the tools and strategies of the Megafone project in Tanzania was that of providing a channel for communication that would enable the necessary flows of information required to satisfy the first and second objectives of the original proposal. These tools and strategies were expected to bridge the gap between farmers and scientists and to provide scientists with direct, unfiltered information about what was happening in the fields.

It is important to note that I had not formulated the ERV Methodology at the time this case study was started. Therefore, the steps I carried out to implement the technical and organizational aspects of this initiative were based both on my experience with the Megafone project and on the conditions, constraints, and opportunities I found as the case study unfolded. In the following section, I will describe *Sauti ya wakulima* in detail and will structure the description according to correspondences between the steps taken to implement the project and the steps of the ERV Methodology. However, it should be clear the such correspondences have been drawn *a posteriori*.

5.2.2. Detailed description of *Sauti ya wakulima.*

The events described in the following sections are not presented in a chronological sequence. However, the dates in which the different actions were carried out are specified throughout the description, in order to clarify the actual order in which they took place.[201]

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[201] I personally carried out all the actions described in this section, unless specified otherwise.

5.2.2.1. Step 1: Identifying a community at risk.

January 2011: Together with another PhD student, Juanita Schlaepfer-Miller, and my official scientific advisor on this project, Angelika Hilbeck, I contacted Dr. Flora Ismail, a professor at the Department of Botany of the University of Dar es Salaam. We asked her to guide us in the process of finding a group of small-scale farmers who might be willing to consider participating in our project. On-site research on drought-resistant crop varieties, which was being carried out by members of the Department of Botany, led us to the agricultural station of Chambezi, located near the town of Bagamoyo. Dr. Ismail recommended that we contact the farmers who regularly gathered at the station. Thus, we arranged a meeting with the farmers with the help of a local extension officer, Mr. Hamza Suleyman (known as Mr. Hamza).

5.2.2.2. Step 2: On-the-ground research and interviews.

5.2.2.2.1. January 2011: During our first meeting at the Chambezi Agricultural Station, the farmers were asked whether they were familiar with mobile phones, and all of them replied affirmatively.[202] They were also asked whether they were familiar with the Internet. While practically none of the farmers had personally accessed a web page or even used a computer, they knew about the Internet and stated that their children were being taught how to navigate the World Wide Web at school.[203]

Seven different farms chosen by Mr. Hamza were visited. The farms were scattered around Chambezi, far apart from each other and, in some cases, located at considerable distances from the few dirt roads in the region. In the farms, a large

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202 According to population data and mobile phone subscriptions in Tanzania, in 2012 there was a mobile phone penetration rate of 60.58%. However, this figure does not account for multiple SIM card ownership, a common practice in Tanzania that allows users to take advantage of price promotions offered by different companies. When multiple SIM card ownership is considered, mobile penetration appears to be significantly lower, at 36%. Mobile subscriptions tend to concentrate in urban areas, where network coverage is stronger. However, over 70% of the population in Tanzania lives in rural areas, suggesting that mobile penetration in regions such as Bagamoyo may be well below 36%. Sources: (National Bureau of Statistics, 2013a), http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx (retrieved 29.10.2014), http://www.marketresearch.com/Business-Monitor-International-v304/Tanzania-Telecommunications-Q4-8372464/ (retrieved 29,10,2014), (Esselaar, Adam, 2013), (National Bureau of Statistics, Ministry of Finance, 2013b)

203 By mid-2011, the Tanzania Communications Regulatory Authority reported 5 million Internet users, with a penetration rate of 11%. However, in-depth research argues that Internet penetration may be significantly lower (around 3.5% of the population) due to "lack of fixed lines, the low use of PCs (below 2%, according to RIA ICT Survey data, 2011-12) and the high cost of broadband connectivity." Sources: https://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=4324 (retrieved 29.10.2014); (Esselaar, Adam, 2013, p. 9)

diversity of crops and fruit trees was observed, including cassava, maize,[204] cowpeas, pigeon peas, ground nuts, cashew nuts, sweet potatoes, oranges, lemons, mangoes, bananas, and coconuts, together with animals, namely chickens and goats. Some farmers also grew tree seedlings that they sold in nearby villages. Although replies differed, it was concluded that farmers had noticed that rainfall had diminished over the last 3 to 6 years.[205] The Bagamoyo region is known to have a bimodal rainfall pattern, with long rains from March to June and short rains from October to January. However, according to the farmers, the short rains had almost disappeared, and the starting time of the long rains had become erratic. As a consequence, the farmers' response to drought was a growing reliance on certain crops that required relatively small amounts of water, such as coconuts, cowpeas, ground nuts, pigeon peas, and certain varieties of maize, and on livestock raising. Lack of rains had also brought a larger incidence of cassava disease, caused by the African cassava mosaic geminivirus.[206] In general, it was observed that the farmers were already trying out diverse crops and techniques in order to cope with climate-related challenges. Coping mechanisms included switching from long-term crops (cassava, maize) to short term ones (cow-peas, amaranth), diversification (goats, chickens, tree nurseries) and planting contingency crops. Difficulties in dealing with diseases such as the cassava mosaic disease or storage pests that also affected cassava were also detected.

While exploring the farms, I repeatedly tested the availability and quality of the mobile data signal. Before carrying out the initial technical tests, I asked several people in Dar es Salaam which telecommunications service provider offered the best coverage in rural areas. They all suggested Airtel, even though it did not offer the

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204 Maize was introduced in Africa in the 16th century by European explorers (Magorokosho, 2007), and is now considered as the main staple food in Tanzania because of its contribution to the daily caloric intake (FAO, 2009). However, cassava is consumed in larger quantities than maize (FAO, 2009), and is the most common crop grown in Bagamoyo. Cassava was likely domesticated in the Amazon basin more than 10,000 years before present (Olsen, Schaal, 1999), and was introduced in Africa by Portuguese traders from Brazil in the 16th century (Nweke, 2005). The introduction of cassava in Africa was so successful that it largely displaced other native crops, such as sorghum, which had allowed the expansion of agriculture in Africa in the past 4,000-5,000 years (Cavalli-Sforza, 2000).

205 A study on the impacts of climate change in the district of Bagamoyo confirmed that from 1999 to 2008 rainfall had decreased (Mkama et al., 2013).

206 This disease is caused by a vector-borne virus transmitted by the whitefly (*Bemisia tabaci*) and disseminated in cuttings derived from infected plants (Fargette, Thresh, 1994). It has been observed that increases in whitefly population, and therefore in the incidence of the geminivirus, are strongly correlated to increases in temperature and relative humidity (Umar et al., 2003).

cheapest prices. At the Airtel office in Mlimani City,[207] I bought an Airtel SIM card and an Internet bundle that lasted for three months. At that time, there were no smartphones available for sale at the Airtel office, nor at the offices of other telecommunications companies in Mlimani City. Although the signal was weak in the remote farms, I was able to successfully send pictures from my smartphone to a special test web page[208] I had prepared. These tests allowed me to conclude that, technically, the project was feasible. I also showed the farmers how to operate the smartphone and noticed that they had trouble looking at the screen because of intense sunlight. They also found it challenging to use the phone's keypad, which was slightly smaller than the ones in the feature phones they normally used.[209] Nevertheless, the farmers understood the technical operation of the phone and were eager to try it by themselves.

Figure 19. Farmers in Bagamoyo receive training on how to use the mobile phone. Photo by Juanita Schlaepfer-Miller, Bagamoyo, Tanzania, 2011.

5.2.2.2.2. March 2012: In Dar es Salaam, Android smartphones were starting to be available in shops at Mlimani City, albeit at prices that were still

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207 Mlimani City is a shopping mall in Dar es Salaam, the largest one in Tanzania. The shops at Mlimani City may be considered to be high-end if compared to the shops commonly found throughout the country. Therefore, since my first visit, I considered the mobile phone stores in Mlimani City as indicators of the new trends being introduced in Tanzania.

208 The test web page is accessible at http://motorhueso.net/tz (retrieved 27.10.2014).

209 For initial tests, I chose the Nokia 6110 Navigator phone, which I had already used at different stages of the Megafone project. The phone was released in 2007 and had the advantages of being relateively cheap compared to other similar phones and featuring an integrated GPS system (Source: http://en.wikipedia.org/wiki/Nokia_6110_Navigator, retrieved 27.10.2014).

prohibitive for farmers.

5.2.2.3. Step 3: Gathering the community, explaining the methodology, and seeking participation.

5.2.2.3.1. January 2011: About 30 farmers attended a meeting at Chambezi that was arranged by Dr. Flora Ismail and Mr. Hamza. The farmers came from nearby villages and farms, which were often dispersed and poorly connected through a network of dirt roads that were impassable during rainy seasons. Angelika Hilbeck and myself explained the objectives of our research to the farmers (with the help of Dr. Ismail who translated our words into Swahili):

- Investigate how rural communities in Tanzania were coping with climate change.

- Identify the diverse problems related to climate change and the role of local knowledge in adapting to them.

- Invite a group of farmers willing to share adaptation strategies with other farmers, local experts, and researchers, by using a sociotechnical methodology specifically developed to support such a process of exchange.

I had prepared a very simple presentation[210] that explained the purpose and operation of the technological aspects of the research. During the talk, I clarified that the project was not meant to offer solutions, but rather sought to engage farmers in an active exchange of knowledge about useful practices and strategies for adaptation to climate change.

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210 This presentation may be found in Appendix C.

Figure 20. Presentation of the project at the Chambezi Agricultural Station. Photo by Juanita Schlaepfer-Miller, Bagamoyo, Tanzania, 2011.

After an internal debate, which lasted about 10 minutes, the farmers unanimously raised their hands to let us know that they were willing to participate. The farmers expressed that the smartphones could become a useful tool for communicating with the staff at the Agricultural Office in Bagamoyo and the authorities in the district offices.

The meeting concluded with an activity proposed by my colleague Juanita Schlaepfer-Miller, which consisted in asking the farmers to make drawings that depicted their farms, their activities, and the pressing challenges that they were facing. The purpose of this activity was to conduct a non-verbal participatory assessment, and was carried out using a methodology called "Rich Pictures," developed as a part of soft systems analysis (Checkland, 1981).[211] A notable outcome of this activity was that the different groups of farmers concurred in pointing out that the most pressing challenge related to climate change was the absence of sufficient rainfall. All of these farmers relied solely on rainwater accumulated in ponds or wells to water their crops.[212] The scarcity of rainwater that they depicted in their drawings

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211 According to Schlaepfer, "Rich Pictures are drawings, sketches, or doodles that have no definite syntax and can be done as a group in order to develop a shared understanding of a complex or ill-defined problem. The farmers were shown an example of a rich picture and encouraged to include themselves in the pictures and the structures of the systems which are part of their farming practice.… The goals of this workshop were to encourage visual thinking about farming and climate change and to develop and deepen a shared understanding of these complex issues within the farmer group" (Tisselli et al., 2012).

212 The farmers' perception of insufficient access to water agreed with a study carried out to establish the availability and

was clearly the main issue on which all seemed to agree.

5.2.2.4. Step 4: Choosing a group of participants.

5.2.2.4.1. January 2011: After the group of farmers at Chambezi agreed to participate in the project, I asked them to choose a group of ten farmers, five men and five women, who would become the direct participants.

5.2.2.4.2. March 2011: Mr. Hamza had asked the larger community of farmers at Chambezi to choose a group of ten people who would participate in the project directly by using the mobile phones to document the effects of climate change, as requested in January. The chosen group consisted of five men and five women whose ages ranged between 40 and 50 years old: Mr. Abdallah Jumanne, Mr. Haeshi Shabani, Mr. Mwinyimvua Mohamedi, Mr. Hamisi Rajabu, Mr. Ally Issa Salum, Mrs. Fatuma Ngomero, Mrs. Rehema Maganga, Mrs. Renalda Msaki, Mrs. Imani Mlooka and Mrs. Sina Rafael. All of them were members of a cooperative that manufactured coconut oil at Chambezi and therefore were already familiar with each other.

5.2.2.5. Step 5: Agreeing on common topics.

5.2.2.5.1. March 2011: I asked the participants at Chambezi to write down the names of what they considered to be the most important crops in their farms. After a lengthy discussion, the participants came up with the following list:

- Muhogo (Cassava)
- Mchicha (Amaranth)
- Matikiti (Watermelon)
- Matembele (Sweet potato leaves)
- Miembe (Mango)
- Michungwa (Orange)
- Kunde (Cowpeas)
- Mipapai (Papaya)

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utilization of water in Bagamoyo, which revealed that the main sources of water for domestic and animal uses were dams and ponds. Only 9% of responders reported water to be "readily available," whereas 50% and 41% responded water to be "not easily available" and "problematic," respectively (Kusiluka et al., 2004).

- Viazi vitamu (Sweet potato)

- Nyanya (Tomato)

- Mpunga (Rice)

- Mahindi (Maize)

I then proposed the group to consider this list as the first set of common topics. By focusing on the crops that farmers found most important, I tried to direct the definition of common topics towards a double goal. On one hand, the names of crops provided a concrete starting point for audiovisual documentation. At the same time, each crop opened a vast array of related topics, such as the way climate change affected its growth, the different uses it had, the techniques applied to cultivate it, or its related pests and diseases. Therefore, after all the participants agreed on the above list, I suggested that they could begin by using the mobile phones to report on the status of their crops, focusing particularly on the biotic and abiotic problems which affected them. However, in order to allow the project to expand semantically and become progressively enriched with new knowledge, I also explained that the list of common topics would remain open, so that any participant could suggest and introduce new ones at any time. The list of topics was integrated into the smartphone application, so that the farmers could choose the one which best described each message.

One of the farmers asked whether they could also publish success stories, besides documenting problems with crops. After redirecting her question to the whole group, they all agreed that positive messages were also important and therefore should be included in the process of documentation.

5.2.2.6. Step 6: Identifying and training a local coordinator.
5.2.2.6.1. January 2011: Mr. Hamza had guided the visits to farms and had facilitated the initial meeting and interviews with the farmers. I noticed that farmers trusted him, and that he had a good level of expertise on crops, especially cassava. He also learned relatively quickly how to use the smartphone and was familiar with computers and the Internet. Because of these reasons, I asked him to act as the local coordinator of the project, even though it had not formally started yet. Mr. Hamza

accepted, so I gave him in-depth training on how to use the smartphone, and I asked him to continue using it until my next visit, and to pay attention to potential technical problems.

5.2.2.6.2. March 2011: I carried out a special training session with Mr. Hamza, during which I showed him in detail how to use the project's web page to browse and edit the messages published by the participants.

Figure 21. The project coordinator, Mr. Hamza, surrounded by participants of Sauti ya wakulima. Photo by Juanita Schlaepfer-Miller, Bagamoyo, Tanzania, 2011.

5.2.2.7. Step 7: Delivering the smartphones and carrying out training sessions.

5.2.2.7.1. March 2011: In Chambezi, I carried out an initial training session with the farmers, with the purpose of showing them how to use the smartphones and the web page. I divided the farmers into two groups, and Mr. Hamza helped me to make sure that each participant had the chance to carry out as many exercises as needed. In the exercises, each farmer had to compose a message by choosing an objective, taking its picture, and recording a voice clip to explain the picture. A keyword that described the message had to be chosen from a list and, finally, the message would then be sent to the project's web page. During the exercises I confirmed that using the phone's keyboard was somewhat difficult for the farmers'

rather rough hands. However, they understood the operation of the application well and took up its usage very quickly. The training also allowed me to identify which farmers showed more eagerness and enthusiasm for using the mobile phone: Mr. Jumanne, Mrs. Msaki and Mr. Ally Issa. After every participant was satisfied with the training, I showed them that the messages they had just captured already appeared on the project's web page. This made the farmers realize that the smartphones could become a means to communicate with others using audiovisual messages.[213]

The purpose of inducing reciprocal behaviors within the group of farmers was concretely enacted by redefining the standard modes of usage of the smartphones, and transforming them into shared tools for documentation and the amplification of *voice*. This redefinition later became one of the basic principles of the ERV Methodology which, as discussed earlier, recommends not to use the smartphones as individual tools, but rather as communal ones. Consequently, I delivered only two smartphones to the group, which would subsequently be shared rotatively by the ten participants. The group discussed how to organize the rotation of the smartphones, and they decided that the best way would be to form two subgroups, each of which would share one of the two available smartphones internally. After the members of the two subgroups had been assigned, I delivered one smartphone to Mr. Jumanne, from the first subgroup, and the other one to Mrs. Msaki, from the second one.

Additionally, I delivered a computer to the entire group, complete with a USB 3G modem and sufficient credit for Internet access. Mr. Hamza was appointed as the person responsible for operating the computer and making it available to any farmer who wished to check the project's web page.

5.2.2.7.2. March 2012: In Chambezi, I met with the farmers and introduced them to the Android smartphones and the new mobile app, *ojoVoz*.[214] They had never seen such phones before, so I conducted an intensive training session in which everyone, including Mr. Hamza, had the chance to learn how to use them. I noticed that the farmers found the touchscreen somewhat troublesome to operate, and they

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213 The test messages sent by farmers on that day of training may be seen at
   http://sautiyawakulima.net/bagamoyo/bagamoyo.php?c=2&date=2011-03-07#content (retrieved 31.10.2014)
214 So far, the participants had been using Nokia 6110 Navigator phones with the Megafone application.

often touched elements of the graphic interface accidentally. However, the group agreed that this problem could be overcome by practice. I made sure that each participant understood the logic of the mobile app, and I replaced the two old Nokia phones with two new smartphones, complete with an illustrated users' manual.[215]

5.2.2.8. Step 8: Agreeing on a schedule for face-to-face meetings.

5.2.2.8.1. March 2011: In our first meeting at Chambezi, the group of participants decided when and how often the subsequent face-to-face meetings would take place. I suggested that, ideally, these meetings should take place once every week. The farmers agreed, and decided that they would meet at the Chambezi agricultural station every Monday to browse and discuss the messages that had been published during the week, and to exchange the phones rotatively.

5.2.2.9. Step 9: Interaction with experts, authorities, and dissemination to the general public.

5.2.2.9.1. March 2011: Mr. Hamza and I informed the local authorities at the Bagamoyo Agricultural Office about the project, and asked them for their consent and support before carrying out any further actions. I explained the purpose of the project to Mrs. Fidelicia, the office director. She expressed her interest in the project, highlighting the potential benefits of being able to monitor the status of crops remotely through the web page. Mrs. Fidelicia asked me to send an official document explaining the project to the Bagamoyo District Director.

5.2.2.9.2. September 2011: Mr. Hamza and I met with the authorities at the Bagamoyo Agricultural Office and also with the district director in order to inform him about our project. Initially, the district director, Mr. Erasto Mfugale, expressed his disapproval because the project had already started without him being informed. I tried to explain that the project was still in a pilot phase, and therefore its local impact was still very small and under complete control. I also gave him a report of our project, which included its goals and methodology, a detailed description and a timetable.[216] The meeting with Mr. Mfugale ended well, and he finally consented to

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215 The *ojoVoz* software platform users' manual is included in Appendix C.
216 The report delivered to the Bagamoyo district director is included in Appendix C.

allow us to continue with the project.

In order to engage the local scientific community, I held a meeting with Dr. Flora Ismail at the University of Dar es Salaam, and asked her whether students or researchers from her department would be willing to integrate the contents published by the farmers into their research projects. I explained that those contents could provide scientists with valuable information coming directly from the field, and could thus inform research initiatives on rural agriculture. Dr. Ismail said she would look for people who might be interested.

5.2.2.9.3. October 2011: I made a first public presentation of *Sauti ya wakulima* at the Mobility Shifts International Summit, hosted by The New School in New York, USA.[217] This presentation became the first effort in disseminating the project to a wider public.

5.2.2.9.4. March 2012: I visited the Bagamoyo District Director's office. Since *Sauti ya wakulima* was already known and had been approved by local authorities, in my visit I aimed at requesting their active support through a letter of engagement. The letter was directed to the Bagamoyo District Director, and sought an agreement in which both parties would assume specific commitments. I delivered the letter and, although the district director approved its terms, he said that he would have the letter translated and sent to the legal department for further revision.[218]

I presented *Sauti ya wakulima* to a group of teachers and students at the Department of Botany of the University of Dar es Salaam. I had previously asked Dr. Flora Ismail to help me find researchers who would be willing to integrate our project into their investigation. However, there had been no positive reply. Thus, my presentation of *Sauti ya wakulima* aimed to explain the project in detail to potential scientific partners and to discuss how could the project inform their research. Although the few people who attended the presentation expressed their interest, they made no concrete commitments to join the project as research partners.

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217 Mobility Shifts International Summit http://mobilityshifts.org/ (retrieved 11.11.2014)
218 The revised version of the letter of engagement delivered to the district director of Bagamoyo is included in Appendix C.

5.2.2.9.5. April 2012: Angelika Hilbeck reported that the personnel and director of the Bagamoyo Agricultural Office expressed that they found *Sauti ya wakulima* useful, as it helped them to see what was going on in the fields. Furthermore, local authorities had included funding for mobile broadband connection credit to be used in the project in the annual district budget. However, the budget was still pending approval from the local ministry.

5.2.2.9.6. November 2013: Mr. Hamza and I presented *Sauti ya wakulima* at the ICT4AG conference in Kigali, Rwanda.[219]

5.2.2.10. Step 10: Conducting evaluation meetings.

5.2.2.10.1. May 2011: During the first evaluation meeting, the farmers jointly expressed that, even in its early stages, the project had already helped them to learn from each other. Since the beginning of the project in March, they had been using the smartphones to document and publish pictures and voice recordings related to the common topics that had been established in the previous meeting, and had also conducted weekly meetings to review the project's web page together with Mr. Hamza. It was during those weekly meetings that the participants could see what others had published during the week, discuss the publications, and ultimately, learn from what others had documented. I asked about specific instances of mutual learning, and the farmers replied with two examples:

- Mr. Haeshi Shabani, one of the participants, said that he had learned how to properly grow maize by looking at a picture[220] that was published by one of his colleagues. During our visits to farms in January, we had noticed that Mr. Shabani's fields were among the poorest, especially his maize plots. Now, he claimed that, thanks to the picture, he had learned that it was necessary to grow the plants on small mounds in order to prevent waterlogging. He also learned that the plants

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219 ICT4AG (Information and Communcations Technologies for Agriculture) Conference in Kigali, Rwanda. 4-8 November 2013. http://ict4ag.org/en/ (retrieved 14.05.2014)
At the conference, Mr. Hamza Suleyman and myself had the opportunity to present Sauti ya wakulima in one of the sessions: http://www.ict4ag.org/en/capacity-strengthening/day-3/social-icts-engaging-with-the-grassroots.html (retrieved 14.05.2014)

220 The picture that prompted this episode may be seen at the following URL:
http://sautiyawakulima.net/bagamoyo/bagamoyo.php?c=4&date=2011-05-01#212 (retrieved 04.11.2014)

would do much better if he planted them during winter rather than in the summer.

Figure 22. The picture that prompted the learning episode about maize cultivation. Published by a participant of Sauti ya wakulima in Bagamoyo, Tanzania, on May 1, 2011. The voice recording that accompanies this picture was translated as follows:

"These maize plants have been planted on terraces so as to prevent water logging."

Figure 23. Mr. Shabani's first successful maize harvest. He took this picture after learning how to cultivate maize properly. Published by Mr. Haeshi Shabani, a participant of Sauti ya wakulima, in Bagamoyo, Tanzania, on June 28, 2011. The voice recording that accompanies this picture was translated as follows:

"This is maize that I grew on terraces after getting advice from my colleague. I got advice on cultivating on terraces during the winter and not in the summer as previously. Maize has begun to dry up and is ready to eat."

- Additionally, Mrs. Renalda Msaki said that a picture on the project's web page had helped her to identify a fungus that was affecting her mangoes.[221]

I asked the farmers if they found that the project was useful for them and whether they wanted to continue. They all answered affirmatively, but requested more smartphones. I explained again that one of the main purposes of the project was to share the smartphones reciprocally; however, I told the farmers that I would try to provide one additional smartphone for the group in the near future.

After our conversation, I suggested the farmers carry out an exercise that consisted in interviewing each other. I provided basic guidelines for the interviews, which included asking the interviewee about his or her agricultural activities, the main challenges they presented, and the strategies for coping with them. The

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221 The picture to which she referred may be seen at the following URL:
http://sautiyawakulima.net/bagamoyo/bagamoyo.php?c=4&date=2011-04-06#130 (retrieved 04.11.2014)

participants performed the exercise, and I made sure that everyone knew how to properly operate the smartphone. The exercise was lively and the results were satisfactory,[222] so I suggested that interviews about other people's experience of climate change could be integrated into the documentation tasks. In order to stress the importance of interviews, I suggested a new keyword, *mahojiano* (interview), which I later incorporated into the list of common topics of the smartphone application. However, some of the farmers had already started to interviewed others before our meeting, and thus the exercise only helped them to refine their interviewing technique. The participants who had already tried to conduct interviews told me that some of the potential interviewees had declined the invitation because of mistrust. We talked about this issue and concluded that not everybody wanted to be interviewed and that, before taking a picture of someone else, it was very important to approach that person respectfully, explain the reasons for doing the interview, and always ask for permission.

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222 The results of the interviewing exercise may be seen at the following URL:
  http://sautiyawakulima.net/bagamoyo/bagamoyo.php?c=2&date=2011-05-30 (retrieved 05.11.2014)

Figure 24. Mr. Haeshi Shabani interviews Mrs. Renalda Msaki during a training session at the Chambezi Agricultural Station. Photo by Juanita Schlaepfer-Miller, Chambezi, Tanzania, 2011.

Finally, I noticed two problems related to the smartphones. The first one had to do with the fact that participants often forgot to open the lid of the camera lens before taking a picture, and this resulted in many black images being published on the project's web page. I stressed the importance of opening the lid. However, I had also noticed that a number of these black photographs were due to the smartphones' lack of camera flash, so I recommended the group to take pictures only during daytime or in well-lit indoor spaces. The second problem had to do with the unstable mobile connectivity at Chambezi. Unlike previous visits, I noticed that the mobile broadband signal had become intermittent and weak. These conditions slowed down the process of browsing the project's web page and severely compromised the transmission of contents from the smartphones. The unreliability of mobile connectivity prompted me to develop a new app that could allow its users to publish audiovisual contents only when network conditions were adequate for transmission.

5.2.2.10.2. September 2011: In Bagamoyo I talked to Mr. Hamza, and he said that the group was very satisfied after the Nane Nane show,[223] because they were able not only to document the event using the mobile phones, but also to show the

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223 The Nane Nane show is an agricultural fair held annually in Morogoro, and is considered to be a national celebration in Tanzania. The show provides farmers with the opportunity to showcase their crops and products, socialize, and do business. For examples of messages published by the participants at the Nane Nane show, please refer to Appendix D.

project's web page to farmers who came from different regions across the country. According to Mr. Hamza, the web page caused a strong effect on viewers, leaving them with the impression that the Chambezi group was very advanced. He said that political authorities had also looked at the web page and were impressed as well. Upon learning about their positive reaction, I suggested the possibility of asking local authorities for funding, in order to cover the basic costs of the project. However, Mr. Hamza told me that this was rather unlikely, as the regional governments were very poor, and were actually cutting spending on extension services.

When I met with the group of participants in Chambezi, only 8 of the 10 original participants were present. Mwinyimvua Mohamedi and Sina Rafael had left the project, and Mr. Hamza said he would eventually try to find two people who could replace them. I started an informal conversation with the farmers by asking them what they had learned from the project, and in what ways it was useful for them. The participants agreed that the project was useful because it had helped them to learn more about different types of problems. They also said that, thanks to the interviews they carried out, particularly at the Nane Nane show, they had been able to meet other farmers and learn from them. They were pleasantly surprised when other farmers actually asked them to be interviewed. Mr. Ally Issa mentioned three specific areas in which he thought the project could be useful:

- Education: learning from other farmers, even those who live and work in far away places.

- Business and trade: products could be advertised through the project's web page.

- Communication: the web page could become a quick and efficient way of communicating with extension officers and local authorities.

Mr. Ally Issa also talked about the need of providing farmers with more technical resources and training, since only very few of them had access to the Internet. He also suggested that we could link the project to a radio or TV program

that could broadcast the messages collected by the Chambezi group. However, I found out that there were no local radio or TV stations in Bagamoyo.

Mrs. Renalda Msaki claimed that, thanks to the weekly meetings and discussions, the project had brought cohesion to the Chambezi group. She also saw that the project had problem-solving potentials, and mentioned that grasshoppers had recently attacked her crops but, thanks to a report she sent using the mobile phone, she had got timely advice from Mr. Hamza and ultimately solved the problem.

Mrs. Msaki pointed out that the project had made her realize that mobile phones could be used for other things besides calling people, and that computers were not just a "fancy thing" for the rich people in towns, as they could also be used by farmers to solve their problems. And, finally, she said that "farmers have a lot of things to say, but no means where to say them."

I then asked a second question to the group: "How can the project be improved?" The farmers agreed that more smartphones and more participants were needed for the project to have a greater impact. Mr. Abdallah Jumanne said that the project was very valuable, and therefore it couldn't be limited to the Chambezi group: it had to include other farmers. Specifically, Mr. Jumanne and the rest of the group asked me to include farmers who lived far away from Bagamoyo, so that they could learn new techniques from them. An additional reply to my question was that they felt they needed more training on how to use the smartphones and the web page. Mr. Jumanne also asked how could they get feedback and assistance once they reported a problem using the smartphones. Mr. Hamza suggested that, when reporting an issue that required assistance from him, the reporter should provide contact information, i.e., a phone number, so that he or other extension officers could send a reply via SMS.

During the conversation, Mr. Ally Issa commented that some farmers had asked him for money in order to be interviewed. We discussed this issue and concluded that our project was not about making money, but about sharing knowledge.

At the end of the meeting, the group agreed to name the project *Sauti ya wakulima*, "The voice of the farmers" in Swahili.

5.2.2.10.3. March 2012: In Chambezi, the farmers explained that they hadn't used the older phones in the two previous months, namely because of technical problems. The mobile antennas at Chambezi had been failing, and thus the network connection was much weaker and slower than usual. My dialogue with the farmers went on to a lengthy discussion about the things they had learned thanks to the project, which included how to properly grow certain crops, how to better raise chickens and goats, and how to apply alternative methods to control weeds. The farmers asked me again to include remote participants in the project, and to link it with local media.

5.2.2.10.4. April 2012: After an individual visit to Bagamoyo, Angelika Hilbeck reported that the speed of the Internet connection was extremely slow in Chambezi, making the process of publishing messages and navigating the project's web page long and tedious. However, the farmers acknowledged that the pictures taken with the new Andriod smartphones were better in quality, making it worthwhile to assume the longer upload and download times. The quick depletion of the smartphones' battery charge was also found to be problematic, aggravated by the scarcity of available sources of electricity. Hilbeck also reported that the group of participants confirmed that they wanted to continue being involved in the project. Again, they requested the scaling-up of the project by including other farmer groups from remote regions.

5.2.2.10.5. December 2012: In Chambezi, I was informed that, in August, the group had attended the Nane Nane show in Morogoro with the explicit goal of documenting the event through interviews with other farmers and participants. The Bagamoyo district authorities had actively supported *Sauti ya wakulima* by giving Mr. Ally Issa a grant to travel to Morogoro to carry out interviews and document the event. It was also Mr. Ally Issa who took a smartphone to document his travels through different regions of Tanzania. Since June 2012, he had practically

monopolized one of the smartphones. Mr. Ally Issa's pictures had reached an increasing level of visual sophistication and, in many of them, he may be seen posing with a phone in his hand: a leitmotiv which became his signature as a reporter.

Figure 25. In the audio clip that corresponds to this picture, Mr. Ally Issa explains why he considers himself a successful mango grower. To illustrate, he asked his three little daughters to artfully pose under a mango tree. Published by Mr. Ally Issa, a participant of Sauti ya wakulima, in Bagamoyo, Tanzania, on December 21, 2012.

Figure 26. Mr. Ally Issa holding a phone in his hand. In the corresponding audio clip, he interviews a farmer about her problems with birds that destroy crops. Published by Mr. Ally Issa, a participant of Sauti ya wakulima, in Bagamoyo, Tanzania, on June 21, 2012.

I was told that two participants, Mr. Hamisi Rajabu and Mr. Abdallah Jumanne, had learned about a new method of raising chicks, thanks to a picture published by Mr. Ally Issa during the Nane Nane show, and had consequently organized a farmers' cooperative that intended to apply this new knowledge. Mr. Jumanne explained that they had started the cooperative through a microcredit loan. He claimed that the chickens required a low investment and had a high return rate in the short term. I was told that livestock keeping was generally increasing among farmers in the region. According to farmers themselves, this increase was mainly due to drought, and it was prompting mounting conflicts between agriculturalists and pastoralists.

Other participants provided concrete examples of what they had learned by discussing the messages published by others:

- Pests that attacked mangoes were detected and documented. A local extension officer was able to provide a technique to deal with these pests after looking at the picture. Weevils, which are common grain pests, were also detected through pictures.

- Photographs of cassava diseases had helped the farmers to learn how to identify them.

- The farmers learned how careless livestock keeping could damage the environment by causing land erosion and deforestation.

The group reaffirmed their interest in continuing with the project and requested again to expand the project by including more farmers from other regions. They also requested more smartphones and an additional computer. I was able to immediately deliver a third smartphone to the group. Finally, Mr. Hamza explained that the Internet connection at Chambezi had recently been unavailable for three weeks.

5.2.2.10.6. June 2013: In Bagamoyo I held an extensive interview with Mr. Hamza and learned that he was using one of the available smartphones, and that he was not sharing it with the farmers at Chambezi. Therefore, considering that Mr. Ally Issa had also kept one of the smartphones to himself, only one was available for the rest of the group.

Mr. Hamza told me that they had found a way of minimizing the costs of mobile broadband usage. First, the farmers recorded and composed all the messages while the smartphones were offline. Then, Mr. Hamza collected the farmers' and Mr. Ally Issa's smartphones once a week, bought a 1-day Internet bundle (which cost only 500 Tanzanian Schillings, roughly equivalent to 20 euro cents) and sent all the messages on that same day. Such an ingenious strategy, devised by the farmers themselves, allowed them to gain financial autonomy and reflected their interest in appropriating *Sauti ya wakulima* and sustaining the project independently of external monetary support.

In Chambezi, I met the farmers with main the purpose of conducting an evaluation meeting and preparing for the upcoming expansion of *Sauti ya wakulima* into Zanzibar. After discussing how to expand the project, the farmers mentioned that they were very proud and happy because they had recently received a telephone call from the Tanzanian Ministry of Agriculture, encouraging them to continue with their work in *Sauti ya wakulima*. The group considered this as a display of recognition from the government. The meeting ended with a presentation by the staff of Juabar, a small Tanzanian-American enterprise that I had previously contacted, dedicated to providing low-cost solar energy solutions to people living in rural contexts.[224]

5.2.2.10.7. May 2014: The number of messages published by the Chambezi group had declined noticeably, suggesting that the participants' interest in *Sauti ya*

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224 Before the trip, I had contacted Juabar and suggested that they visit Chambezi. Juabar manufactures solar kiosks specifically designed to charge several mobile phones. The Chambezi group was very interested and was eventually able to pool enough money to collectively buy a kiosk. It was expected that the solar kiosk would contribute to solving the problem of short-lasting battery power and would also serve to raise the farmers' income by allowing them to recharge other people's phones batteries as a paid service. For more information about Juabar, see: http://juabar.com/ (retrieved 19.11.2014).

wakulima was diminishing. According to Mr. Hamza, only Mr. Abdallah Jumanne and Mrs. Renalda Msaki had been using one of the smartphones, while Mr. Ally Issa had continued to monopolize the remaining one. When I asked him why the other farmers were not using the smartphone, Mr. Hamza replied that they found it difficult to use the device, and that they preferred the previous model because of its keypad. Concretely, they found that the touchscreen of the newer phones was too difficult for them to master.

Mr. Hamza also told me that he had decreased his activity as an extension officer and was planning to start a small business. The main reason for this was that the government had cut spending on extension services, pushing Mr. Hamza into a difficult economic situation.

Angelika Hilbeck and I visited the farmers in Chambezi, and only a few of them were present. Despite the declining usage of the smartphones, the participants said that they were still receiving expressions of recognition, and that they were now known as "the phone group." Mr. Hamisi Rajabu added that, before the project, the farmers didn't have a space to talk to each other about agriculture, but now they had created one. When I asked them whether they had lost their interest in *Sauti ya wakulima*, they replied that they were still interested, and that they wanted to continue with the project. However, in face of the evidence provided by the strong decline in the publication of contents, I took their reply with skepticism.

5.2.2.11. The expansion of *Sauti ya wakulima*[225].

5.2.2.11.1. January-May 2013: After the repeated requests from participants to expand the project and include farmers living in far away regions, I discussed with Mr. Hamza the different possibilities of integrating a new group of farmers into *Sauti ya wakulima*. These discussions took place via email, and it was decided that we should try to engage farmers from Zanzibar. The reasons for choosing Zanzibar were twofold. In the first place, Zanzibar and Bagamoyo share similar environmental features that directly influence agricultural production.[226] This

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225 The later stages of Sauti ya wakulima were financed by the Swiss NGO Brot für alle (Bread for all): http://www.breadforall.ch/ (retrieved 13.08.2015)
226 The Coastal Region of mainland Tanzania, where Bagamoyo is located, and Zanzibar, share similar temperatures and a

similarity ensured that the practices carried out by farmers in one of those places could potentially be applied in the other. The second reason for attempting to expand the project into Zanzibar was that Mr. Hamza had an ongoing contact with the Kizimbani Research Institute of Agriculture, located on the island. Therefore, I asked Mr. Hamza to prepare our future visit to Zanzibar in order to introduce *Sauti ya wakulima* to local farmers and authorities.

5.2.2.11.2. June 2013: Angelika Hilbeck and I visited Tanzania with the main purpose of starting the expansion of *Sauti ya wakulima* into Zanzibar. In Chambezi, I interviewed the farmers and asked specific questions to the group. Among other questions, I asked them what would they like to learn from other farmers, especially now that *Sauti ya wakulima* was about to expand to Zanzibar. They replied that, in the first place, they would like to learn which crops they were growing, since people always grew things that were specific to their region. They also said they wanted to learn about other farmers' techniques for coping with climate change and about their livelihoods. They were particularly interested in learning how other farmers managed in different conditions.

I also asked the group what they would like to teach other farmers. The first answer was that they wanted to share their knowledge about smartphones and the Internet and the ways in which the group was using those tools to gather and share information. They also mentioned certain agricultural techniques, such as planting crops using "recommended spacing," the usage of manure, compost, grasses, and other local fertilizers, crop rotation, and improved ways of raising chicken. The participants selected Mr. Ally Issa and Mrs. Renalda Msaki as their representatives, who would join Angelika Hilbeck, Mr. Hamza, and I in our trip to Zanzibar.

In Zanzibar, we visited the Kizimbani Research Institute of Agriculture in order to present *Sauti ya wakulima* to its staff and director, Mr. Haji Salehe. Mr. Salehe confirmed that, as in Bagamoyo, cassava was considered to be a staple crop.[227]

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bimodal pattern of rainfall with comparable levels of millimeters per year. The land on both locations is gently undulating and features sandy soils (Meena et al., 2008; World Bank, 2014; De Pauw, 1983).

227 According to Mr. Salehe, people in Zanzibar generally preferred rice. However, cassava was the most important crop in terms of cultivated surface. About 90% of farming families in Zanzibar grew cassava, and the totality of available cassava was grown and eaten locally. The Kizimbani research Institute had been breeding cassava for 25 years, with the

Then, in a lengthy and passionate speech, Mr. Ally Issa explained the benefits of the project to Mr. Salehe and other members of the institute. We complemented his presentation with considerations about ways in which *Sauti ya wakulima* could potentially become a useful resource for the researchers at Kizimbani. After expressing his interest, Mr. Salehe informed us that he would arrange our visit to two different farmer groups, so that we could present our project and invite them to join. Our guide would be Mrs. Fatma Haji, a local extension officer who was also a good friend of Mr. Hamza.

On the following day we visited Bumbwini and Kilombero, two groups engaged in participatory cassava breeding initiatives articulated by the institute. Unfortunately, because of time and money constraints, we were only able to spend a few hours with each group. During our brief meetings, Mr. Ally Issa and Mrs. Msaki demonstrated the use of the smartphones to the local farmers, and they seemed to be very interested. After these visits, I conducted a special training session with Mrs. Fatma and made sure that she understood how the mobile app and the project's web page functioned. I finally delivered a smartphone to her and trusted her with the mission of sharing it with the two groups of farmers we had contacted. However, between June 2013 and May 2014, not a single message from Zanzibar was published in the project's web page.

5.2.2.11.3. May 2014: While in Bagamoyo, Angelika Hilbeck and I visited a new group of farmers called Tukipendana, who had also been receiving regular guidance from Mr. Hamza. I introduced the project to this new group and gave them one smartphone. However, because of time constraints, I trusted Mr. Hamza to train the farmers on its usage in the near future.

In Zanzibar, I learned that Mrs. Fatma had encountered some technical problems with the smartphone, and she claimed that those problems were the main reason why she hadn't used it or shared it with the farmers. However, Mr. Hamza had visited Mrs. Fatma four months earlier with the specific purpose of solving

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aims of achieving varieties that could become adapted to the local environment, resist diseases, meet farmers' preferences, and produce high-quality flour for industrial use.

technical issues. Ultimately, the reasons why Mrs. Fatma had not used the smartphone were not clear. While we were on the island, we visited two new farmer groups in the villages of Bambi and Machui. I delivered one smartphone to each group, and also gave them a full day of training. Despite her previous failure to activate *Sauti ya wakulima* in Zanzibar, I again trusted Mrs. Fatma to oversee and coordinate these group's usage of the smartphones. However, as will become evident in the analysis of *Sauti ya wakulima*, the last visit in May had a weak effect on the interest of participants. Nevertheless, up to this writing, the farmers in Chambezi and those in the newly integrated groups had continued to publish messages on the project's web page, albeit rather meagerly.

5.2.2.12. Significant messages published by the participants of *Sauti ya wakulima.*

Examples of significant messages published by the participants of *Sauti ya wakulima* are included in Appendix D.

5.2.3. Analysis of *Sauti ya wakulima*.

5.2.3.1. Messages published over time.

A total of 2,753 messages were published by the participants of *Sauti ya wakulima* between March 7, 2011 and November 5, 2014. On average, 2.05 messages were published per day on that period. The following graph reflects the publishing dynamics of the farmers from Chambezi.
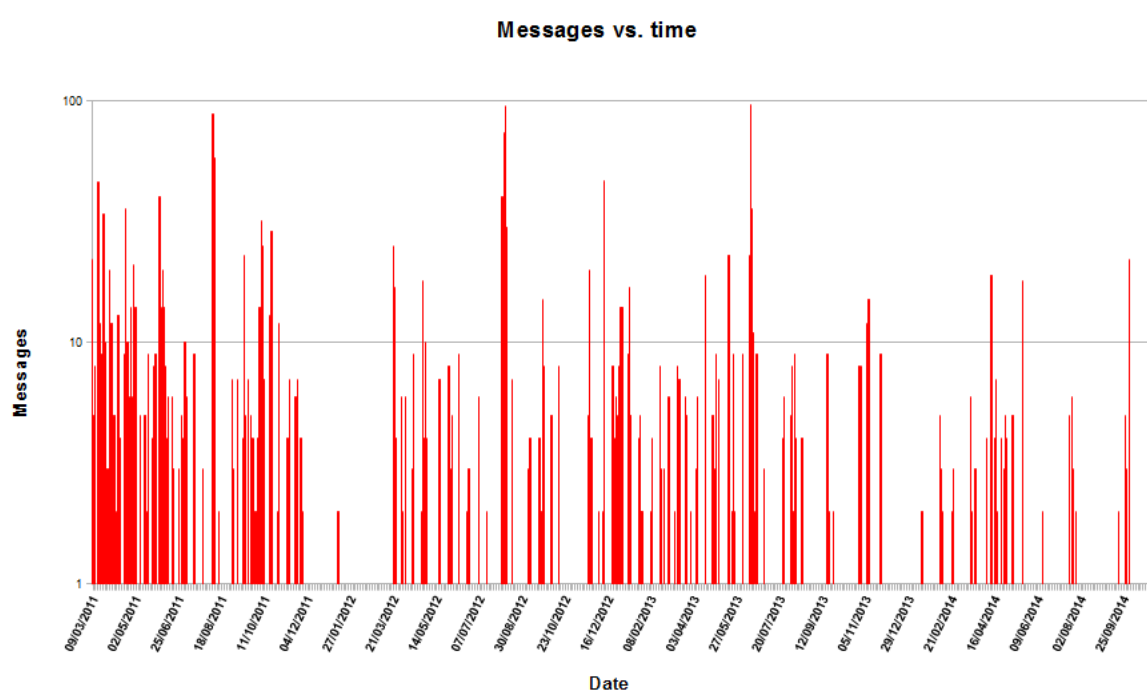
Chart 2. Publishing dynamics of the participants of Sauti ya wakulima over time. The Y-axis is shown in logaritmic scale. By Eugenio Tisselli, 2015.

The graph reveals that both the frequency with which messages were published, as well as the amount of published messages, follow irregular patterns. Farmers used the smartphones frequently between March and November in 2011, rarely spending more than one week without publishing at least one message. An important interruption of the publishing activity took place between November 2011 and March 2012, caused by the technical problems explained in the previous section. After March 2012, the frequency of publication diminished gradually.

In terms of volume, the spikes in the graph reveal significant events. In the

following figure, the scale of the Y-axis of the graph was changed from logarithmic to linear in order to highlight the importance of the spikes.
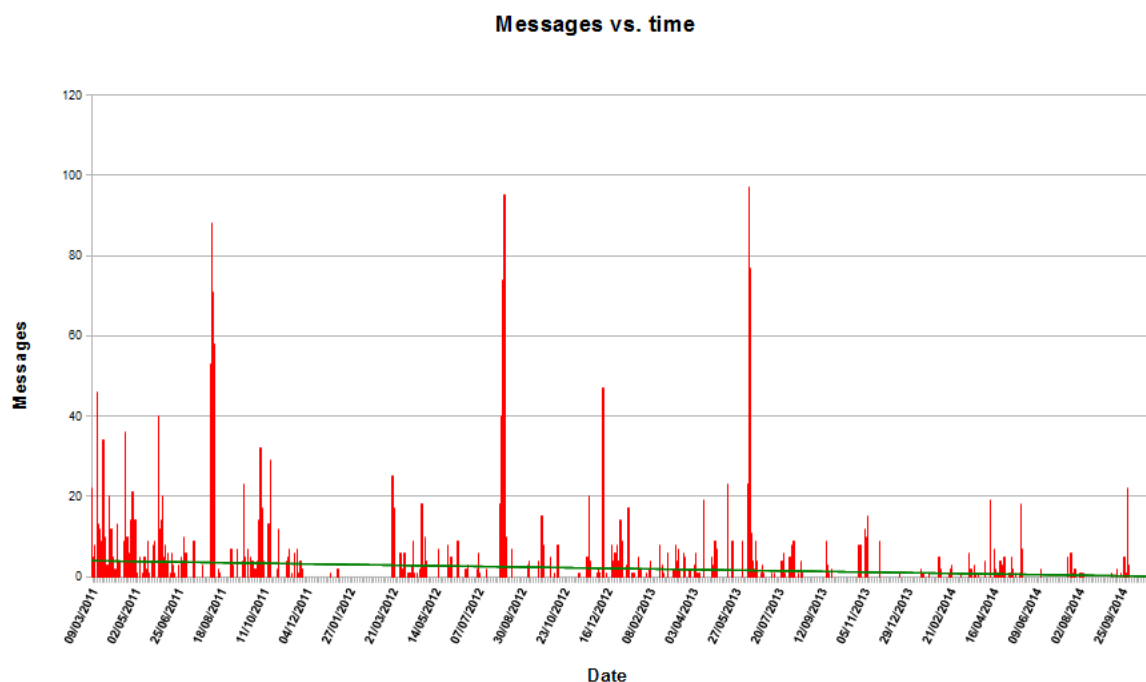
Chart 3. Publishing dynamics of the participants of Sauti ya wakulima over time. The Y-axis is shown in linear scale. The linear regression reveals the progressive decline in the amount of published messages, and is shown in green. By Eugenio Tisselli, 2015.

Three spikes clearly stand out. The first one, between the 4th and 7th of August 2011, corresponds to the documentation of the Nane Nane show in Morogoro. Likewise, the second spike corresponds to that same event, which took place one year later, between the 2nd and the 9th of August. The third spike reflects the large amount of messages published by Mr. Ally Issa Salum and Mrs. Renalda Msaki during our visit to Zanzibar, between the 10th and the 14th of June 2013.

Other significant (but smaller) spikes tend to coincide with the weekly meetings in Chambezi or other particular events such as training sessions or periodic evaluation meetings.

5.2.3.2. Tag-based analysis.

Tags are a central element of analysis in *Sauti ya wakulima*. They can be

divided into two groups: tags used by farmers and study tags. In the following sections, I will analyze each of these two groups.

5.2.3.2.1. Tags used by farmers.

As explained, an initial set of 12 tags was chosen by the farmers. However, the *ojoVoz* software platform allowed participants to introduce new tags at any time. A total of 106 different tags were used during the analyzed period, which means that the participants introduced 94 new tags. The analysis of the tags used by farmers focuses on the most significant tags, that is, those tags that were used to describe at least ten messages each. The following table shows these tags.

Tag	Frequency
Mahojiano (interview)	1452
Muhogo (cassava)	131
Mahojihano (interview, alternative spelling)	52
Mchicha (amaranth)	43
Matembele (sweet potato leaves)	43
Mahindi (maize)	43
Miembe (mango)	39
Mpunga (rice)	37
Kunde (cowpeas)	27
Matikiti (watermelon)	23
viazi vitamu (sweet potatoes)	21
Kuku (chicken)	19
Michungwa (orange)	18

Table 6. The most frequently used tags in Sauti ya wakulima. By Eugenio Tisselli, 2015.

Of the 13 most frequent tags, 3 had not been included in the initial set: *mahojiano*, *mahojihano* and *kuku* (chicken). Conversely, two of the tags included in the initial set, *nyanya* (tomatoes) and *mipapai* (papaya), were not used significantly.

The following graph shows the cumulative usage of the 13 most frequent tags over time.
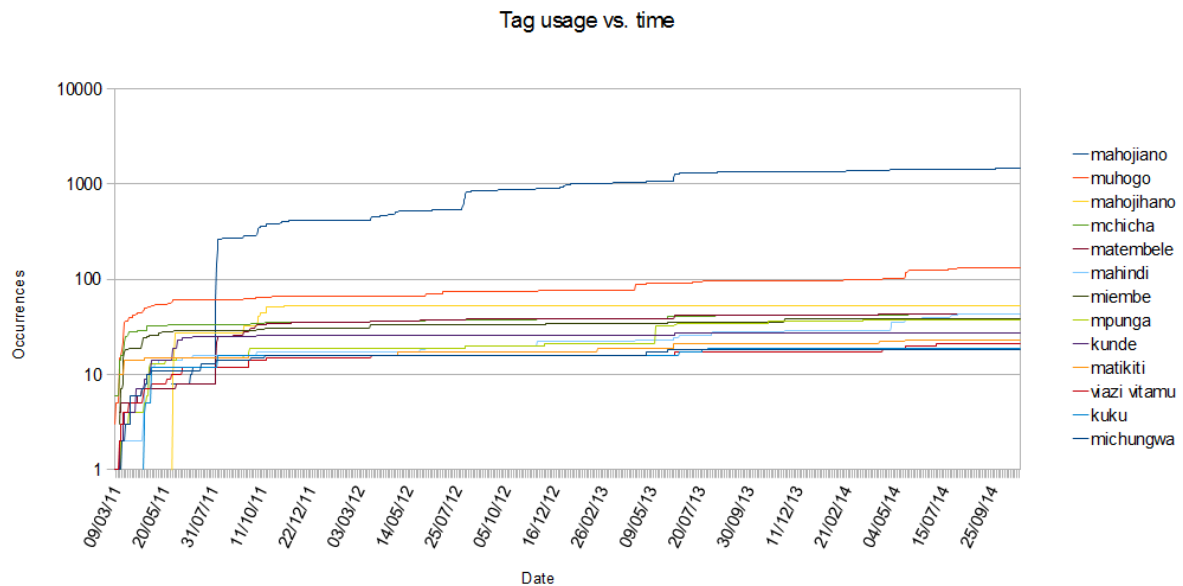
Chart 4. Cumulative frequency of tags used by the participants of Sauti ya wakulima over time. The Y-axis represents the number of times that a specific tag was used, and is shown in logarithmic scale. By Eugenio Tisselli, 2015.

The most salient feature of this graph is that the tag *mahojiano* was not only used overwhelmingly more than all other tags, but that its usage continued to increase while the rest stalled. To fully appreciate the importance of mahojiano, the same graph is shown below with the Y-axis in linear scale.
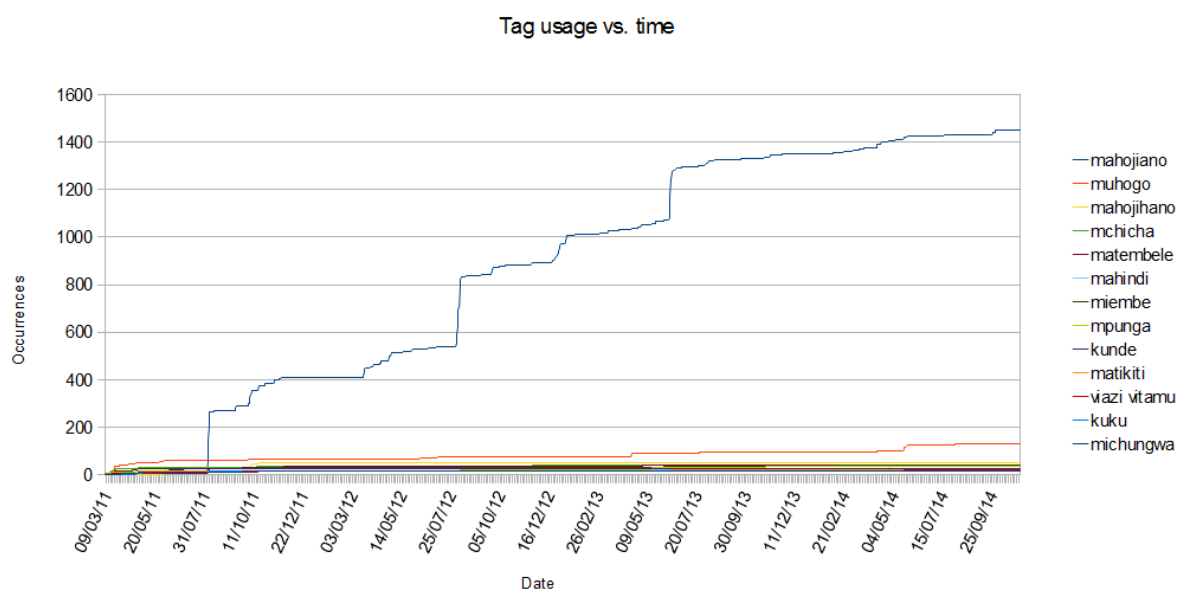
Chart 5. Cumulative frequency of tags used by the participants of Sauti ya wakulima over time. The Y-axis represents the number of times that a specific tag was used, and is shown in linear scale. By Eugenio Tisselli, 2015.

The first time that the tag *mahojiano* was used coincided with my visit to Chambezi in May 2011. As explained, I suggested this tag to the participants and, in a later visit, I added it to the built-in list of tags of the *ojoVoz* mobile app. Before the tag became part of that list, it had to be typed directly by those who wished to use it. Because of this, 12 alternative spellings of *mahojiano* were used, including *mahojihano*, which was used 52 times. Eventually, as the correct spelling of the tag became stabilized, all of its alternatives were bundled into a group called *mahojiano*, thanks to the tag grouping function of the web-based platform.

The participants' tendency to prefer *mahojiano* over all other tags might suggest that conducting interviews became their preeminent activity within the project. The dates when the largest increases in the usage of the tag took place coincide with those of the Nane Nane shows and other social events. However, a close review of the messages published by farmers demonstrates that *mahojiano* became a sort of *catch-all* tag selected by farmers to describe a wide diversity of matters. Soon after the tag was first used, it was applied to describe messages that documented pests or plant diseases, training sessions, different agricultural practices, evidence of climatic events and, of course, interviews. Therefore, it may be

said that the usage of *mahojiano*, and its related misspellings was, to some extent, inaccurate, and that it was very likely used as a quick way to tag a message without thinking too hard about the most appropriate word.[228] This hypothesis is supported by the fact that the number of inaccuracies related to *mahojiano* increased over time.

The following table shows the estimated accuracy rate of the 5 most frequently used tags:[229]

Tag	Accuracy
mahojiano	47.11%
muhogo	60.36%
mchicha	25.59%
matembele	16.28%
mahindi	69.77%

Table 7. Estimated accuracy of the most frequently used tags in Sauti ya wakulima. By Eugenio Tisselli, 2015.

The accuracy of *muhogo* increased over time, while the usage of *mchicha* was erratic from beginning to end. The accuracy of *matembele* was extremely low, and the usage of *mahindi* was consistent throughout the analyzed period. The average accuracy of the usage of these tags is 43.82%. However, the overall accuracy of tagging in *Sauti ya wakulima* might be lower than that of the most frequent (and therefore statistically most significant) tags, since this analysis did not consider messages that should have been described using one of the above tags but were described by different ones instead, or not described at all. To summarize, it may be concluded that less than half of the messages published by the participants were tagged accurately.

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228 An alternative hypothesis is that the meaning of *mahojiano* might have been understood more broadly by the participants of *Sauti ya wakulima*, and that a word such as *kumbukumbu* (memory or record in Swahili) might have been more appropriate to accommodate a wider range of topics.

229 The accuracy rates were obtained by checking whether the audiovisual elements of a message matched the tag used to describe them. These rates are estimates because, in particular messages, contextual information that might be decisive in determining whether the usage of their corresponding tags was accurate or not, is unavailable. Therefore, in all cases, the accuracy rate may be lower.

5.2.3.2.2. Study tags.

The contents published by participants were subjected to a tag-based analysis in which special tags, called *study tags*, were used. The purpose of the analysis based on study tags was to determine the extent to which the project may have encouraged *reciprocal voice* and also to reveal the different purposes that the farmers had when using the smartphones. The decision to apply study tags to analyze *Sauti ya wakulima* was inspired by a number of basic principles of visual research defined within the field of visual anthropology.[230] These principles are briefly described as follows.

1. Only visual evidence that is contextually complete may be responsibly analyzed. Contextual completeness may include interviews that explain what is seen in a picture.

2. Open observation in the process of analysis is essential for the discovery of the new and unforeseen. The ideal analysis process allows the visual evidence to lead to its own conclusions.

3. Analysis involves a movement from raw visual data to refined conclusions, a process that is a form of reduction.

4. A typological approach in the analysis of visual evidence breaks the content into categories that reveal statistical information about the whole.
(Collier, Collier, 1986)

These principles were taken only as a guideline, as classical visual anthropology still assumes that it is the anthropologist who carries out the task of taking pictures in order to visually study a group of people. Conversely, in the case studies presented here, it is not the researcher but the participants themselves who

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230 Visual anthropology explores photography, film, and video as research tools which, together with associated methodologies, may extend the researchers' perception of the object of study. The field ranges over all aspects of culture that are visual; however, it has not been fully incorporated into anthropological practice, perhaps due to the inherent ambiguity of images (Collier, Collier, 1986; Ruby, 1996).

produce the visual evidence that may subsequently be the subject of analysis. Moreover, because of the way in which the tools and methodologies applied in the case studies were designed, visual information is always accompanied by a voice recording. This contrasts with the separateness of visual and vocal information assumed in visual anthropology, at least in its classical approach. Therefore, visual representations were not analyzed in isolation from their contextual meanings, provided by the recorded accounts of what was pictured.

As a result of the process by which I applied these principles to analyze the audiovisual contents of *Sauti ya wakulima*, I derived the following set of six study tags, which I subsequently used to categorize the messages published by the participants.

Knowledge: Messages in which a fragment of knowledge related to any aspect of agriculture is explicitly shared. Within the project, the process of sharing knowledge happened at least in two different ways. In some cases, the participant who recorded and published a message did so with the intention of sharing his or her own knowledge with the visitors of the project's web page. In others, knowledge was shared through interviews carried out with the purpose of learning something from someone else.

Socializing: Messages in which a participant met other people and recorded his or her conversation with them, regardless of whether significant information was exchanged or not.

Evidence: Messages in which any kind of audiovisual evidence was explicitly recorded and published. What was considered as evidence covered a wide range of topics related to agriculture. These mostly consisted of issues and problems such as crops affected by droughts or heavy rains, pests or plant diseases, but also included instances of good practices such as systems of drip irrigation or the results of training sessions.

Advertising: Messages in which a participant or an interviewee explicitly

advertised his or her products or services. In many cases, contact information for the advertiser was provided.

Needs: Messages that feature the explicit expression of a specific need or problem. This tag is different from the tag *evidence*, since it describes messages in which problems were not only pointed out, but also presented as issues that required specific intervention. In some cases, the voice recordings that accompanied the messages marked with this tag explicitly requested assistance.

Creativity: Describes messages that depict creative solutions to specific agricultural problems. This tag was also applied to messages in which artisans or craftspeople were interviewed and asked about their work.

I claim that these tags reflect the extent to which *voice* and reciprocity were present in *Sauti ya wakulima* and also the extent to which these values may have been reinforced. As discussed, one of the most important aspects of *voice* within a community is its capacity to share information and knowledge related to a *commons*. Therefore, by using the tags *knowledge*, *evidence*, *needs*, and *advertising* I attempted to investigate whether the participants of *Sauti ya wakulima* had raised their *voices* and shared those of other people in order to activate a mutual exchange of knowledge and information relevant to their *commons*. The tag *creativity* was also used for this purpose and, with its added connotations of *innovation* and *social recognition* (an important aim of *reciprocal voice*), allowed me to determine the extent to which new knowledge was generated within the community and whether it was perceived as a source of pride. Finally, the study tag *socializing* allowed me to determine whether the participants had attempted to expand and strengthen their social networks (and, potentially, create a basis for the establishment of reciprocal relations) through their activities within the project.

The following chart shows the number of messages described by the different study tags.
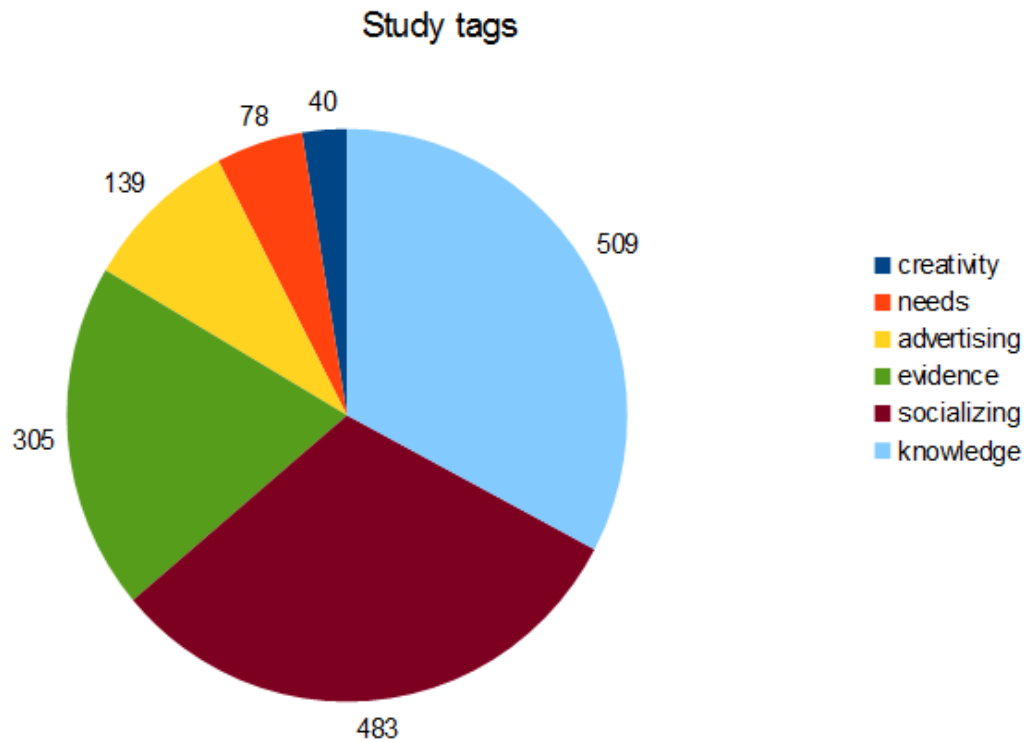
Chart 6. Distribution of study tags used to analyze the contents of Sauti ya wakulima. By Eugenio Tisselli, 2015.

According to the first principle of visual analysis explained above, which states that only visual evidence that is contextually complete may be responsibly analyzed, study tags were applied exclusively to those messages accompanied by a transcription and translation of their corresponding audio recording. Of the 1,718 messages transcribed and translated between March 7, 2011, and December 31, 2013, 1,554 (90.45%) were described by at least one study tag. The remaining messages were not described because they did not carry discernible or significant information.

5.2.4. Conclusions for *Sauti ya wakulima.*

In the following paragraphs, I will attempt to sustain the claim that the main contribution of *Sauti ya wakulima* to this research consisted in the development of an open-ended methodology based on the reciprocal knowledge *commons* produced by the participants of the project. The production of this *commons*, in turn, arguably resulted in the reinforcement of *reciprocal voice* within the group of participants and, possibly, within other small-scale farmers in their larger social context. I will also point out the shortcomings of *Sauti ya wakulima*, which were mainly reflected in the project's failure to trigger a process of *cross-community research*.

5.2.4.1. Reinforcement of *reciprocal voice* and transformative usage of technology.

The application of the study tags *socializing*, *advertising,* and *creativity*, and their frequent occurrence throughout the published messages, suggests that *Sauti ya wakulima* successfully activated a process of socialization among farmers. By transforming the way in which the smartphones were originally intended to be used, the participants took steps to build a reciprocal *safety net* of social relations that, despite its incipiency, revealed their willingness to make their voices heard and to hear the voices of others. This process entailed the activation of a flow of agricultural knowledge as well. Thus, the intentions and actions of the participants provide a practical support to the claim that, in face of the multiple and complex challenges that arise from anthropogenic climate change and the rule of deregulated economic markets, a significant factor for enacting effective adaptation strategies might be the reciprocal flow of knowledge about agriculture, considered as a *commons*.[231]

I claim that the study tags *knowledge*, *evidence*, and *needs* reveal that the participants of *Sauti ya wakulima* were not only aware of the effects of climate change, but also of the importance of sharing knowledge with others as a way to

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231 In her research about the links between neoliberalism and climate change, author and activist Naomi Klein quoted economist Raj Patel: "… there are … successful experiments, worldwide, showing how climate-smart agriculture can work. They're characterized not by expensive fertilizer … and proprietary seeds …, but (by) knowledge developed and shared by peasants freely and equitably" (Klein, 2014, p. 135).

adequately face them. This claim is supported by the abundance of interviews done by the participants. In many of these interviews, the goal was to establish a dialogue whose result could be the exchange of knowledge about a specific topic at hand. In a number of cases, socialization occurred as a side effect of these interviews. The graph that shows the number of messages published by participants throughout the duration of the project suggests that social events were a strong motivation to reciprocally exchange knowledge.[232]

Besides interviews, episodes in which knowledge was shared also took place during the weekly face-to-face meetings at Chambezi. The episode in which Mr. Haeshi Shabani learned how to properly grow maize by looking at a picture on the project's web page and discussing it with his colleagues during a weekly meeting illustrates how mutual learning happened among participants. However, this example raises one question: Why had Mr. Shabani not talked to his colleagues about his problems before looking at the picture on the web page? After all, they already knew each other before they became participants of *Sauti ya wakulima*. When I asked this question to Mr. Hamza, he replied that the fact that farmers got together in Chambezi did not necessarily mean that they exchanged knowledge about agricultural practices among them; rather, they talked about other everyday issues. Based on this learning episode and Mr. Hamza's reply, I suggest that the messages on the project's web page acted as triggers for conversations which, in turn, revealed knowledge that had previously remained in a latent state within the group. This claim resonates with one of the principles of visual anthropology:[233] "photographs can also be tools with which to obtain knowledge beyond that provided through direct analysis.... They can function as starting and reference points for discussion of the familiar and the unknown ..." (Collier, Collier, 1986, p.99). However, in the case of *Sauti ya wakulima*, the photographic images published by the participants do not

232 The weaving of a net of social relations and the activation of *reciprocal voice* to share agricultural knowledge was particularly relevant in Bagamoyo, considering that the area suffered from a severe lack of agricultural extension services. According to a report issued by the Bagamoyo Agricultural Office in 2011, one of the greatest weaknesses in the local agricultural infrastructure was the lack of sufficient extension officers. At that time, there was a ratio of 1 extension officer per 1,145 farmers, almost half of the ideal ratio of 1:600 established by the office (Bagamoyo District Council, 2011).
233 The notion that photographs can be triggers for conversations is also present in the writings of Ariella Azoulay, who claimed that a photograph is the evidence of an event that the photographic image can not exhaust by itself. Thus, the photograph is an invitation to reread its image and engage in the social process of constructing its meaning (Azoulay, 2008).

transfer knowledge by themselves, but rather convey more or less precise meanings when combined with their accompanying voice recordings.

The description and analysis of *Sauti ya wakulima* suggest that the participants claimed full ownership of the project: a process that became fully realized by August 2011. By that time, and particularly during the Nane Nane show in Morogoro, it became clear that the participants of *Sauti ya wakulima* had transformed the project into a platform for the mutual exchange of knowledge. They deviated from the original purpose of documenting the effects of climate change, and started to focus on things that perhaps mattered more to them (but were nevertheless interconnected with climate-related challenges and coping strategies) such as learning from each other and making their *voices* heard. I posit that the participants' appropriation of the research goals of *Sauti ya wakulima* entailed, to some extent, a process of questioning and contextualization of the involved technologies. Although the materiality of the technological artifacts and the architecture of the software platforms were not directly transformed by the farmers, their usage deviated from what was originally agreed upon. This conscious deviation can be regarded as a form of critical usage, whose results may be transformative.

As discussed, my interventions in the context of this case study were directly influenced by the informal practices of the Megafone project. However, the positive outcomes of *Sauti ya wakulima*, namely the participants' spontaneous transformation of its goals and tools, as well as the reinforcement of *reciprocal voice* through their production of a knowledge commons, prompted me to develop and formalize the ERV Methodology. Yet, despite these successful findings, *Sauti ya wakulima* also presented a number of important shortcomings.

5.2.4.2. Failing to trigger *cross-community research.*

As discussed, farmer-held knowledge must be regarded not only as a valuable addition to scientific research, but also recognized as an autonomous system of knowledge that may interact with science, ideally on an equal level. For this interaction to become a virtuous one, the integration of scientific and farmer-held

knowledge has to overcome dualistic approaches by focusing on epistemological diversity (Green, 2008). According to this vision, the different systems of knowledge ought to be evaluated not on their capacity to express a real world, but on their ability to make sense of it. Consequently, overcoming the dualism between scientific and traditional farmer-held knowledge entails a strong sensitivity to the context where the latter exists and is produced, thus opening the door to a broader valuing of communal and reciprocal practices and forms of knowledge in agriculture. As observed in Bagamoyo, farmers in affected areas are already adapting to climate change in many different ways, often by relying on their own systems of knowledge and observation. Farmer-held knowledge, far from being static, tends to be integrated into a dynamic process of which one of the main determinants is the extent of climatic vulnerability (Kpadonou et al., 2012). However, this dynamic process often develops under the tension exerted by dominant scientific knowledge, hence the need to create synergies between the different systems to alleviate such tension (Kpadonou et al., 2012). Unfortunately, such synergies did not materialize in the context of *Sauti ya wakulima*, as scientists in Tanzania failed to see the project as a valuable platform for interacting with farmers and, therefore, did not become actively engaged despite repeated invitations to do so. When asked why they had not integrated the contents of *Sauti ya wakulima* into their own research projects, scientists at the University of Dar es Salaam replied that they did not see how they could fit them in, or simply that they didn't have the time to do it. These replies suggest that greater efforts must be made in order to create synergies between scientific and farmer-held knowledge.

The challenges perceived by the farmers who took part in *Sauti ya wakulima* ranged from biotic threats such as the increased incidence of pests and plant diseases, to abiotic threats including droughts and floods caused by heavy rains, or related economic threats, namely erratic local markets. Their adaptation strategies, focused on securing the availability of food and raising their income, included trying out a wide variety of crops, particularly those with a greater resistance to drought such as cowpeas, growing cash crops such as cashew nuts or ground nuts, or resorting to livestock keeping. Many of these strategies did not involve what could be called traditional agricultural knowledge, but rather contextualized modern

agricultural techniques which, in many cases, may not necessarily be considered as ecologically sound (the usage of chemical pesticides and fertilizers, for example). Hence, an active implication of scientists, particularly from the field of agroecology, would have helped the farmers to reorient such strategies into more environmentally sustainable ones.

5.2.4.3. Other shortcomings of *Sauti ya wakulima*.

Sauti ya wakulima presented a number of shortcomings, related both to the way in which the project was designed and carried out and the specificities of the social, technical, and environmental context where it was implemented. The analysis of the project's dynamics over time clearly shows that the group's interest in the project gradually declined, particularly after March 2012. The reasons why the farmers progressively decreased the number of publications may be manifold and, since the participants paradoxically reaffirmed time and again their interest in continuing with the project, these can only be expressed as conjectures. Probably the strongest reason for the declining interest was the failure to actively involve local scientists, agricultural experts, and local authorities, despite repeated attempts to do so. In a considerable number of messages, particularly those described by the study tags *evidence* and *needs*, participants explicitly called for the assistance of experts to help them solve problems that affected their crops or, more broadly, their livelihoods. Although Mr. Hamza and his colleagues at the Bagamoyo Agricultural Office constantly monitored the project's web page, the lack of adequate and timely responses might have discouraged the participating farmers. Nevertheless, the project was relatively successful in attracting the attention of local and national political authorities, even though their involvement was weak.[234] In this respect, farmers understood that, through the project, they could potentially make their voices heard across different levels of the Tanzanian political spectrum. The possibility of reaching out to local and even national politicians who, in some cases, also reached back to the participants, may have strengthened the group's recognition

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234 The involvement of local authorities in the project was a rather weak one. The agreements stated in the letter of intent delivered to the Bagamoyo District Office, for example, never materialized. Nevertheless, authorities repeatedly expressed their interest in the project, limiting their support almost exclusively to verbal approval and, occasionally, giving out small transportation grants to farmers, as was the case with Mr. Ally Issa.

within the political sphere, possibly compensating for (at least partially and indirectly) the lack of attention from scientists and experts.[235]

Another possible explanation of why the group's interest in the project declined over time was the failure to effectively integrate other groups of farmers into its base of participants. Throughout the project, the farmers in Chambezi repeatedly requested the inclusion of other groups of farmers, so that they could both learn from them and share with them their own knowledge and techniques. To satisfy their request, we attempted to contact and invite groups of farmers in Zanzibar. However, the participation of these new groups failed to materialize in a significant way. The reasons for this failure might be found both in the rushed way in which I carried out the interventions in Zanzibar, due to a shortage of time and financial resources, but also in the insufficient involvement of local actors, who were not proactive and probably did not fully understand the potential usefulness of the project. As a result, reciprocal communication with remote farmers did not emerge, and this outcome may have disappointed the participants in Chambezi.

An additional reason for the project's gradual decline might be found in the physicality of its technological interfaces and the possibly insufficient training sessions provided to the farmers. As explained, some farmers found it difficult to manipulate the smartphones and had never accessed the Internet. Although I carried out training sessions and entrusted Mr. Hamza with the task of following them up, it became clear that not all farmers showed equal levels of technical ability and willingness to use the smartphones and the web page. This inequality may have prompted the taking over of the available tools by the most able and willing users, such as Mr. Ally Issa who, at some point, practically monopolized one of the smartphones. Thus, farmers who found it more difficult to approach and manage the tools may have simply retreated from the project, although they still participated in the weekly and periodic meetings. Moreover, the analysis of the tags used by the farmers, found to be largely inaccurate, suggests that the participants in Chambezi did not navigate the project's web page in detail. The usefulness of tags lies in the fact

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235 The reach of the *voices* of the participating farmers was further expanded through online dissemination activities. A sample presentation used to disseminate the case studies is included in Appendix C.

that they can be used as filters to access specific fragments of information. The conjecture that tagging was, quite possibly, not fully understood, suggests that farmers may not have seen their usefulness as tools for navigation. This was most likely due to the farmers' lack of familiarity with the Internet, but also because of the inconveniences caused by poor local connectivity and the shortage of access to connected computers.

5.2.4.4. The looming challenges revealed by the contents of *Sauti ya wakulima*.

The messages published in *Sauti ya wakulima* not only revealed a set of rather urgent strategies for coping with diverse challenges, but also the noticeable impulse of many farmers to become *entrepreneurs*. In their messages, the word *entrepreneur* was explicitly used 47 times to describe the interviewees' activities while, in other instances, this depiction was expressed less explicitly. As discussed, the notion of *entrepreneurship* is a core value of neoliberalism, and thus its presence within a cultural system may be understood as an indicator of that regime's influence. However, as discussed earlier, the advancement of neoliberalism in Tanzania is still in its early stages and coexists with more reciprocal forms of exchange. This hybrid scenario was clearly revealed in *Sauti ya wakulima*: on one hand, farmers formed cooperatives and were willing to openly share their knowledge with others. On the other, they expressed the desire to become successful entrepreneurs[236] and therefore winning players in local and global markets. It has been argued that individualistic attitudes associated with the monetized neoliberal economy have not been prevalent in Africa and have coexisted with more reciprocal ones (Latouche, 2007). Yet, as this case study reveals, these attitudes, embodied in the model of the *entrepreneur*, are quickly gripping the imagination of farmers. I claim that, because of the risk presented by this increasing individualization of the

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236 The advancement of neoliberal values in Tanzanian agriculture has been largely encouraged by initiatives such as Kilimo Kwanza, which explicitly tends to push farmers into monetized markets, both local and global, and thus forces them to "modernize" their practices and become entrepreneurs. Kilimo Kwanza is a plan implemented by the Tanzanian Government to make the agricultural sector a major contributor to economic growth. The plan was launched in 2009 and is based on ten *pillars* that include the modernization and commercialization of small-scale agriculture, the mobilization of public funds to support agricultural development, and the encouragement of private investment (Source: http://www.tzonline.org/pdf/tenpillarsofkilimokwanza.pdf, retrieved 05.12.2014). Significantly, the reinforcement of learning and the exchange of agricultural knowledge is not included in Kilimo Kwanza. In fact, in a personal communication, Mr. Hamza expressed that the government was severely underfunding agricultural extension.

forms of exchange, reinforcing reciprocity within communities of small-scale farmers may become an increasingly significant strategy to ensure that sustainable forms of agriculture are not washed away by models based on the notions of self-interested competition and individual profit. Nevertheless, in parallel to the growing urge of becoming integrated into the logic of markets and profit, the participants of *Sauti ya wakulima* showed a strong tendency towards reciprocal forms of exchange. In sum, the case study revealed a hybrid scenario in which *reciprocal voice* is certainly at stake.

5.3. *Los ojos de la milpa.*[237]

5.3.1. Justification.

In the months of July and August 2011, as the case study in Tanzania was taking shape, I decided to carry out a similar project in Mexico. Its general aims were:

- To apply the recently formalized ERV Methodology in a practical case study carried out in the context of a rural, small-scale farming community, in order to test its potential to induce *reciprocal voice.*

- To learn about traditional agricultural practices in indigenous communities in Mexico, particularly in the state of Oaxaca.[238]

In order to determine the specific topics, goals, and location of the second case study, I requested the assistance of Dr. Leobardo Jiménez Sánchez, professor and researcher in the field of rural development at the Colegio de Postgraduados (Postgraduate College) in Texcoco, near Mexico City. After discussing my aims and methodologies, Dr. Jiménez suggested that I should approach a group of agronomists who had implemented an agroforestry initiative in several indigenous communities in the Sierra Mixe of Oaxaca.[239] The initiative, called MIAF (Milpa Intercalada con Árboles Frutales, or Milpa Intercropped with Fruit Trees), was developed by agronomists of the Colegio de Postgraduados as part of a larger project, known as PMSL (Proyecto Manejo Sustentable de Laderas, or Sustainable Hillside Management Project) The implementation of the MIAF initiative in the Sierra Mixe

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[237] The project *Los ojos de la milpa* was funded entirely by the author.

[238] The reason for this particular aim was of a rather personal nature: having been born in Mexico City, I felt the need to learn more about indigenous cultures in my own country. As discussed in chapter 3, indigenous voices have been systematically silenced in Mexico. And yet, for more than 5 centuries, forms of sustained resistance closely tied to reciprocity and small-scale agriculture have allowed indigenous peoples, particularly in the southeastern state of Oaxaca, to persist in the face of a continuous economic, cultural, and political aggression effected by the Mexican government and other actors, some of which have been described in chapter 3.

[239] The Sierra Mixe is a district in the northeastern area of Oaxaca. It is a mountainous region that comprises 17 municipalities and covers 4,930 square kilometers. Most of its inhabitants are of Mixe ethnicity, and the Mixe language is spoken throughout the region. The main agricultural products of the Sierra Mixe are maize and beans, which are cultivated using the milpa system. Source: http://www.oeidrus-oaxaca.gob.mx/fichas/tomoI/distrito14.pdf (retrieved 07.01.2015)

followed specific objectives:

- Preventing soil erosion caused by rainfall, by intercropping[240] fruit trees with maize[241] and bean plants. The insertion of rows of fruit trees among the rows of maize and bean plants allows farmers to build what is known as a *live barrier*. A live barrier may be built by placing pruned branches between the fruit trees, forming thus a natural filter that effectively reduces the damage caused by hydric erosion. The formation of live barriers is particularly relevant in Mexico, where almost 20% of small-scale agriculture is practiced on hillsides and therefore exposed to erosion caused by rainfall. The rugged hillsides of the Sierra Mixe are characterized by steep slopes, with gradients ranging between 20% and 50% and, because stonewall terraces are practically nonexistent in the region, most *milpas* are cultivated on sloping terrain.

- Protecting plant biodiversity by integrating the cultivation of local varieties of fruit trees into the common agricultural practices of farmers.[242]

- Through photosynthesis, fruit trees are expected to act as agents for the sequestration of carbon (CO_2) found in the atmosphere, aiding thus in the efforts to mitigate climate change.

- The fruits produced by the intercropped trees may potentially become an additional source of sustenance and income for small-scale farmers and their families.
(Cortés et al., 2005; Vergara, Etchevers, 2006)

Studies have shown that the application of the MIAF system has contributed to improve soil fertility in the Sierra Mixe by increasing the levels of organic matter

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240 Intercropping is an agricultural technique in which two or more crops are grown together in order to maximize cooperation and minimize competition between them (Sullivan, 2003).

241 Mesoamerica is considered as the center of origin of maize, and its earliest macrobotanical evidence, dated to 6,200 B.C. (Sluyter, Domínguez, 2006), is related to the archaeological records collected in the caves of Guilá Naquitz, Oaxaca, not far from where I carried out *Los ojos de la milpa*.

242 For centuries, farmers in the Sierra Mixe had taken advantage of the native fruit trees that grew wild in the region. However, those trees had never been explicitly cultivated before the introduction of the MIAF system (Cortés et al., 2005).

and mineral nutrients (Vergara, Etchevers, 2006). The MIAF system has been portrayed as a sustainable and effective agroforestry technique that allows a certain degree of farmer participation during its implementation. The species and varieties of trees that are intercropped in the milpas are determined together with the farmers, following different criteria: adaptation to local climate, marketability of the fruits, and personal preferences (Cortés et al., 2005).[243] However, the specific processes involved in the growing of trees, which include techniques such as the pruning of branches, thinning of fruits, and control of pests and diseases, implied the introduction of new knowledge in the Sierra Mixe. Therefore, I established the main goal of the new case study: to invite farmers in the Sierra Mixe to use the ERV Methodology to create a *community manual* on how to properly grow fruit trees in the *milpa* according to the MIAF system. A paper manual that explains the different techniques involved in the MIAF system was published in 2005 by the researchers at the Colegio de Posgraduados (Cortés et al., 2005). However, I considered that this manual presented serious limitations:

- The language of the manual was too technical, since it was written by experts in agronomy who were not willing or able to express the techniques related to the MIAF system in a way that could be readily understood by farmers, or non-experts in general.

- Its distribution was limited to only a thousand copies, most of which were, as far I could attest, gathering dust inside a storage room in the academic institution.

- Perhaps most importantly, the paper manual did not integrate the *voices* of farmers who implemented the MIAF system, presenting thus a purely academic vision of a series of techniques that, as I initially assumed, were susceptible of being transformed and enriched continuously through the knowledge and practice of farmers who implemented them.

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243 However, the choice of trees is constrained by the fact that only species that may be grown using the Tatura Trellis system can be used to form a live barrier. The Tatura Trellis is a "close-planting" system for fruit trees in which trees are pruned and trained to form a V-shaped canopy. The main advantage of the system is that it allows maximum light interception and light distribution in the tree. In the Sierra Mixe, appropriate species include peach, apple, and pear trees (deciduous), or citruses, guava, and avocado trees (perennials) (Source: http://www.depi.vic.gov.au/agriculture-and-food/horticulture/fruit-and-nuts/orchard-management/the-tatura-trellis-construction, retrieved 08.01.2015), (Cortés et al., 2005).

Because of these shortcomings, I believed that the creation of a *community manual* would not only allow farmers who implemented the MIAF system to document its techniques using their own terms and language, but could also become a dynamic and accessible platform for the sharing of agricultural knowledge. If successful, an online *community manual* created through the ERV Methodology could be freely shared with other farmers, so that others could also adopt the system in their own *milpas*. The original goal of creating such a platform for knowledge sharing, however, would remain as open as possible so that farmers could eventually appropriate the methodology and its related tools to make their *voices* heard, as was already happening in Tanzania at that time.

5.3.2. Detailed description of *Los ojos de la milpa.*

The following sections are structured according to the different steps of the ERV Methodology and describe how those steps guided the development of *Los ojos de la milpa*. By the time I started *Los ojos de la milpa*, I had already formalized the ERV Methodology, and therefore I intended to follow it as closely as possible in this new case study. Moreover, when applying the steps of the ERV Methodology, I relied heavily on my experience with *Sauti ya wakulima*, and consequently tried to apply in Oaxaca what I had recently learned in Tanzania.

5.3.2.1. Step 1: Identifying a community at risk.
5.3.2.1.1. January 2012: With the guidance of Dr. Ángel Ramos Sánchez, an agronomist from Oaxaca who originally implemented the MIAF system in the Sierra Mixe, I determined that I would carry out this case study in the community of Santa María Tlahuitoltepec (Tlahui), a town famous for its Center for Musical Training and Development of the Mixe Culture (CECAM),[244] and therefore considered as a cultural hub in the region. Tlahui is also one of the communities in Oaxaca governed under the autonomous political model known as an *internal normative system*, briefly discussed in chapter 3, in which representative democracy

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244 CECAM: Centro de Capacitación Musical y Desarrollo de la Cultura Mixe. http://www.cecam.org.mx/ (retrieved 08.01.2015)

(and therefore the existence of political parties) is largely rejected by delivering political power to a public assembly instead. This system may be considered as a highly reciprocal one, since many of the principles expressed by the notion of *comunalidad* are used as practical guidelines for the organization of daily life. However, as also I also discussed, the form of political organization present in communities such as Tlahui often forces their inhabitants into a permanent resistance against the pressures exerted by the central Mexican Government, as well as that of the State of Oaxaca.

I decided to divide the project into two groups that corresponded to two settlements located within Tlahui: Santa Ana and Juquila. Creating this division would not only allow me to compare the activities carried out by each group, but also to avoid the possible misunderstandings derived from working with only one group while excluding other farmers. I learned that, although there existed an association that grouped together all the farmers who implemented the MIAF system, farmers had also formed smaller associations within their specific towns or settlements. Consequently, farmers from both Santa Ana and Juquila had their own, independent forms of organization within the larger MIAF initiative.

5.3.2.2. Step 2: On-the-ground research and interviews.

5.3.2.2.1. January 2012: In my first visit to Tlahui, I was accompanied by Dr. Ángel Ramos and Mr. Odilón Martínez, a local agronomist who also acted as extension officer by training farmers in the region on how to carry out the different techniques of the MIAF system. Some members of Santa Ana and Juquila had already been briefed about the project before my visit.

In Santa Ana, I met with the community inside a small shack located by a milpa that belonged to one of its members, Mr. Félix Vázquez Guitérrez. I learned that 25 different farmers had adopted the MIAF system in Santa Ana, and some of them had been implementing it for as long as seven years. The fourteen farmers who attended the meeting, seven men and seven women, informed me that they had chosen peach and apple trees to intercrop with their maize and bean plants.

During my visit, I found that the cellphone coverage in Santa Ana was practically nonexistent. In fact, I learned that the whole community of Tlahui was served only by one cellphone antenna.[245] This infrastructure was not only insufficient to satisfy the communication needs of the community, but its service was severely limited by the mountainous terrain. Therefore, cellphone coverage largely depended on the specific location from which the connection was made, and Santa Ana was located far from the antenna, with a small mountain in between.

In Juquila I met with seven farmers (four men and three women) who informed me that, in contrast with Santa Ana, they were just beginning to implement the MIAF techniques in their milpas. I also learned that farmers both in Juquila and Santa Ana were currently using paper logs to keep track of their MIAF practices, and that these logs presented some problems: they were difficult to share with the researchers and agronomists, and sometimes the farmers forgot to fill them in. Dr. Ramos and Mr. Odilón hoped that the case study would contribute to solve these issues; however, I made sure that they understood that its main purpose was to activate the flow of knowledge, rather than assisting with housekeeping tasks.

During my visit to Juquila, I witnessed a number of challenges presented by the MIAF techniques. Mr. Odilón took advantage of our visit to Juquila and carried out a short training session on how to conduct the winter pruning of the peach trees. The trees were suffering from a fungal disease, *Taphrina Deformans*,[246] locally known as *Verrucosis*, and their branches needed to be pruned just below the affected buds. However, because the branches of peach trees were very hard to cut, expensive, high quality pruners were required. Moreover, the cut had to be subsequently sealed and protected with a special kind of wax that was only available in the city of Oaxaca. A fungicide was also used to treat the disease, and farmers asked Mr. Odilón to provide them with high doses, as it was also available only in the city and was rather

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245 A few months after starting *Los ojos de la milpa*, I contacted a person who worked at the Mexican headquarters of Ericsson, a multinational corporation that, among other things, manufactures cellphone antennas. In an informal conversation, this person told me that they were interested in selling more antennas to Mexico's leading telecommunications provider, Telmex, so that they could expand their coverage. However, Telmex was not interested in installing additional infrastructure in poor regions such as the Sierra Mixe because, as the member of the Ericsson staff said, these regions were not regarded as "profitable markets."

246 *Taphrina Deformans* is a fungal infection that affects peach trees, among other species. Its incidence and symptoms are made worse by climatic conditions (cold weather and high humidity) such as those present in Tlahui. Source: http://eol.org/pages/188590/overview (retrieved 09.03.2015)

expensive for them as well. Although some of the challenges presented by the MIAF system had to do with the availability of tools and farming inputs (and potentially raised doubts about the supposed sustainability of the MIAF system), the most pressing ones required an intensification in the transmission of practical knowledge. Thus, based on the knowledge-based challenges I identified, I believed that the creation of the *community manual*, overseen by an agronomist such as Mr. Odilón, could be particularly relevant for those farmers who were just beginning to implement the system in their milpas.

5.3.2.3. Step 3: Gathering the community, explaining the methodology and seeking participation.

5.3.2.3.1. January 2012: During the initial meetings in Santa Ana and Juquila there were lengthy debates between the farmers, who spoke mostly in Mixe. I was informed that they expressed some doubts and concerns about the purpose of the project, fearing that I would appropriate their work and knowledge.[247] I tried to reassure them by explaining that they would be able to autonomously conduct and reshape the project as they saw fit and that the concrete results of their participation would always remain accessible on the project's web page. Nevertheless, the farmer groups in Santa Ana and Juquila told me that they needed some time to discuss whether or not they should become involved, so we agreed that we would meet again on February 10 in Santa Ana, and on February 11 in Juquila.

5.3.2.3.2. February 2012: The farmers in Santa Ana and Juquila confirmed their willingness to participate in the project.

5.3.2.4. Step 4: Choosing a group of participants.

5.3.2.4.1. January 2012: In my first meeting with the farmers in Santa Ana and Juquila, I requested the farmers in both communities to choose five participants per group, in case they decided to participate in the project. I told them I could deliver one smartphone per group, and that the device would then be shared by the

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247 As I was repeatedly informed, inhabitants of Tlahui were quite wary of researchers who approached them only to extract their knowledge, which was subsequently used for unknown purposes, or to conduct research whose results were never shared with the community. According to my informants, these episodes had become all too common in Tlahui and had consequently provoked a largely suspicious attitude towards *foreign* researchers.

five chosen people in each community. I also asked them to consider a balanced gender distribution when choosing the participants.

5.3.2.5.2. February 2012: The farmers in Santa Ana had chosen a team of five people who were willing to use the smartphone to document and share their practices related to the MIAF system. The chosen participants were Germán Vázquez Vázquez, Emelia Vázquez Jiménez, María Vázquez Jiménez, Dalia Ester Martínez Vázquez, and Victoria Vázquez García. The team was made up mostly by young women who were already familiar with smartphones and the Internet, despite the fact that these tools and platforms had become accessible in the region only very recently.

The farmers in Juquila had chosen five participants: Angelina Vázquez Vázquez, Froylán Vázquez Gallardo, Brígida González Jiménez, José Claudio Vázquez Gallardo, and Genny del Rosario. The group in Juquila was more diverse than the one in Santa Ana, with two men and three women. One of them, Genny del Rosario, was actually an immigrant from the Yucatán peninsula who had recently married a man from Juquila and consequently moved there.

5.3.2.5. Step 5: Agreeing on common topics.

5.3.2.5.1. February 2012: In Santa Ana, I conducted a discussion in which the group chose its common topics, which then became the tags that would be used subsequently to describe their messages:

- Poda (pruning)
- Raleo (thinning of fruits)
- Encalado (whitewashing trees to prevent pests)
- Fertilización (fertilization)
- Cosecha (sowing)
- Fumigación (fumigation)
- Plaga (pest)
- Industrialización (industrialization)

Although the group originally formulated these tags in Spanish, I told them that they could use the Mixe language at any time within the project, if they so wished.

In Juquila, the group chose the following tags:

- Poda (pruning)
- Deshierbe (clearing the weeds)
- Fumigación (fumigation)
- Encalado (whitewashing trees to prevent pests)
- Plaga (pest)
- Barbecho (fallowing, preparation of the soil)
- Cosecha (sowing)
- Limpia (clearing the weeds)
- Fertilización (fertilization)

Some of these tags matched those chosen by the group in Santa Ana and, although I pointed out that *Deshierbe* and *Limpia* were probably synonymous, the group decided to keep both.

5.3.2.6. Step 6: Identifying and training a local coordinator.
5.3.2.6.1. February 2012: In Santa Ana, I asked the group to choose a local coordinator. After a brief discussion, Germán Vázquez, the only male member of the group, was proposed. I subsequently carried out an intensive training session with Germán and made sure that he had the necessary means to stay in contact with me.

In Juquila, the group agreed to name José Claudio Vázquez as the local coordinator. As I did with Germán Vázquez in Santa Ana, I gave José Claudio an in-depth training and made sure we could keep in contact.

Mr. Odilón was regarded by the farmers as an authority figure in the context of the MIAF initiative. During my visits, he helped me to explain the project to the farmers and also acted as translator. After observing the expertise of Mr. Odilón, the

trust that farmers placed in him, and considering the fact that he visited their milpas regularly with the purpose of supervising the MIAF system, I decided to appoint him as the overall coordinator of the groups in Juquila and Santa Ana. Consequently, I provided him with an additional smartphone so that he could use it to publish messages on the project's web page and thus also contribute to the creation of the *community manual*.

5.3.2.7. Step 7: Delivering the smartphones and carrying out training sessions.

5.3.2.7.1. February 2012: In Santa Ana I conducted an intensive training session and made sure that everybody understood the correct functioning of the smartphones and the project's mobile app, *ojoVoz*. I delivered a smartphone to Germán Vázquez, the local coordinator, and asked him to manage its proper usage within the group.

In Juquila, I found that most participants took up the usage of the smartphone and the mobile app rather quickly, with the exception of Brígida and Genny, who were too shy to try the smartphone. I didn't want to publicly force them to follow the training session, so I asked them to learn from their colleagues at a later time. After the training session, I delivered the smartphone, a notebook computer, and a 3G modem with sufficient credit to the group, so that the farmers could access the Internet and collectively discuss the messages they had published.

5.3.2.7.2. April 2012: I delivered a notebook computer and a 3G modem to Germán Vázquez. Even if there was no mobile broadband access in Santa Ana, I suggested that Germán take the computer to the downtown area of Tlahui in order to access the web page, just as he did with the smartphone whenever he wanted to send the messages he had recorded.

5.3.2.7.3. August 2012: After the original group of participants in Santa Ana had disintegrated, I trained Mrs. Vitaliana Vázquez, a new participant who had explicitly asked to be included in the group, on how to use the smartphone and the web page. She did not have previous experience with these tools, but her 10-year old

son, who was present at that time, seemed to be quite familiar with computers and smartphones, so I asked him to assist his mother. I delivered the smartphone, computer, and USB modem to Mrs. Vitaliana and her son, hoping that they would use the tools fruitfully and that they would share them with the other farmers in Santa Ana.

Figure 27. Mrs. Vitaliana and her son receive training on how to use the smartphone during a session in Santa Ana. Photo by Joana Moll in Santa Ana, Santa María Tlahuitoltepec, Mexico, 2012.

5.3.2.8. Step 8: Agreeing on a schedule for face-to-face meetings.

5.3.2.8.1. February 2012: In order to overcome the lack of connectivity in Santa Ana, which would hamper the process of collectively browsing the project's web page in subsequent face-to-face meetings, I approached a local cybercafe in Tlahui with the aim of asking its owner to allow the participants from Santa Ana to gather there periodically and access the Internet. I agreed to pay him an amount of money that would guarantee the participants weekly access for the next two months, both to the concrete space of the cybercafe and to the Internet. An additional challenge, which reached far beyond my capacities, was that the association of farmers in Santa Ana was itself going through a crisis that apparently made it very difficult for them to get together.[248] Because of this situation, the group was unable to

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248 Because of what I experienced as a rather secretive attitude, I was not able to learn the details of the crisis from the

establish a schedule for face-to-face meetings. Consequently, I simply asked the group to meet at the cybercafe as often as they could and to rotate the smartphone on demand: whenever a participant asked to use the smartphone, the local coordinator had to make sure that it was delivered as soon as possible.

In Juquila, I learned that the farmers usually gathered at the house of a farmer called Diego Vázquez which, compared to other houses in the community, seemed to be larger and richer. It also had the important advantage of being very near to the single cellphone antenna in Tlahui, and therefore allowed a good connectivity for the group's face-to-face meetings. Since the house was available for periodic gatherings, the group agreed that the meetings to discuss the contents of the project and share the smartphone would take place there every week.

5.3.2.9. Step 9: Interaction with experts and authorities and dissemination to the general public.

5.3.2.9.1. July 2012: In Tlahui, I tried to contact the communally owned and managed radio station, Radio Jenpoj, with the aim of disseminating and raising the community's interest in *Los ojos de la milpa*. I went to the small shack where its headquarters were housed and was immediately interviewed by the radio presenter, who asked me some questions about the project. Rather than broadcasting it live, the interview was recorded, and I told the presenter that I would ask Froylán Vázquez from Juquila to pay a visit to Radio Jenpoj so that he could also explain the project in his own words.

5.3.2.9.2. August 2012: I visited Tlahui with the intention of contacting the local authorities in order to seek their active support. Before my visit, I had met the daughter of the mayor of Tlahui in the city of Oaxaca, and she recommended for me to visit her family's house. There, I talked to my friend's sister, Tonantzin Díaz, who agreed to transcribe the audio recordings published online by the participants of the case study and translate them into Spanish. I also had the chance to talk very briefly to her mother, Sofía Robles Hernández, the first female mayor in the history of Tlahui. I presented and explained the project to her and, although she expressed her

farmers at that time. However, as I will subsequently describe, some of its causes were gradually revealed later.

interest in the project, she did not make an explicit commitment to support it.

5.3.2.10. Step 10: Conducting evaluation meetings.

5.3.2.10.1. April 2012: I visited Santa Ana together with Mr. Odilón and met with Germán, the local coordinator. On that occasion, Germán invited us to participate in the offering ceremony described in chapter 3. After the ceremony and an abundant meal, I learned that Germán was the only member left in the group. Two of the young women who were chosen by the community as participants had gone to Tijuana, probably to look for jobs, and Germán hadn't heard from the other two after our first meeting in February. I also learned that the cybercafe in which the group was supposed to gather and browse the project's web page had closed down shortly after my visit. Despite these problems I asked Germán to carry on with the project and to look for new participants among the community as well.

In Juquila, Mr. Odilón and I found that the group of participants had also disintegrated. We met with Froylán, who told us that the group had shown little interest in using the smartphone, insinuating that its other members were envious because they thought that he and his brother José Claudio (the local coordinator, who was not present on that day even though he had assured that he would be there) were monopolizing the smartphone. Furthermore, Froylán told us, there had been changes in the local association of farmers who implemented the MIAF system and, because of those changes, which were the subject of an ongoing dispute, they had not been able to hold their regular meetings for the past two months. However, Froylán expressed his interest in carrying on with the project and asked for permission to use the smartphone to document other things besides the techniques of the MIAF system, such as local celebrations or interviews related to different topics. I told Froylán that he was free to document and publish any topic he found relevant, as long as it remained somehow connected to the original purpose of the project. I left Froylán with the task of reforming the group in Juquila, and asked Mr. Odilón to support him.

5.3.2.10.2. July 2012: Mr. Odilón and I met with the farmers in Santa Ana. About ten people were present at the meeting, but none of them were members of the

original group of participants, and not even Germán, the local coordinator, was among them. Consequently, the meeting largely consisted in discussions about topics outside the case study.[249] However, Odilón took upon himself the role of reforming and leading the group of farmers who were supposed to participate in the project and invited them to reform the group and share the available smartphone among them. He told them that the smartphone could become a useful tool for detecting problems such as pests or diseases and stressed the need to learn about the MIAF system in a more visual way. We then discussed how to coordinate the reciprocal rotation of the smartphone. The exact reasons why the smartphone had not been shared so far were not clear at that time. Some farmers said that they did not trust Germán, and others mentioned that there was probably a general lack of interest in the project. Moreover, the farmers rarely got together, so the opportunities for rotating the smartphone or browsing and discussing the web page were actually very scarce. In order to overcome this situation, I proposed that, instead of sharing the smartphone during regular meetings led by the coordinator, anyone who wanted to use it should ask for it and, if it was available, use it until someone else wanted to use it. In this way, I hoped to distribute the responsibility of organizing the smartphone's usage and, to some extent, to reinforce reciprocity by making the participants aware of each other's right to use the tool for a common purpose.

In Juquila I found only Froylán and his brothers, Sergio and José Claudio, and we all went into their *milpa* carrying the smartphone. They were proud to show me how well their maize plants had grown, and they took the aerial roots of the maize plants as a sign of their strength.[250] When I asked Froylán why the participants outside his family had not asked to use the smartphone, he replied that maybe it was because they had not understood the project, or simply because of a lack of interest. I asked Froylán, who so far had been practically the only member of the group that used the smartphone, to continue using it and to share it with other farmers in Juquila as much as possible. Before leaving, I asked Froylán to go to Radio Jenpoj to

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249 The farmers discussed issues such as the correct distance between fruit trees and maize plants, when and how to use fertilizers, sanitary guidelines for growing peach trees, including the proper preparation of the Bordeaux mixture used for liming, and how to make fly traps using plastic bottles.

250 According to Froylán, this renewed strength of the maize plants was due to their usage of a mycorrhizal fertilizer, which enriched the once-impoverished soil and was originally introduced to them by Mr. Odilón. Froylán had even used a photo of the aerial roots of a maize plant as the background image for the smartphone's screen.

complete the interview about our project that I had previously initiated, by sharing his views and opinions about it. Unfortunately, despite his affirmative reply, Froylán failed to visit the radio station to complete our interview, and it was never aired.

In the city of Oaxaca, I held a meeting with Mr. Odilón and Dr. Ángel Ramos, in order to discuss the project, *Los ojos de la milpa*.[251] They expressed their interest in the project, despite the fact that the different strategies to encourage the sharing of the smartphones had not worked so far. Mr. Odilón proposed to provide additional smartphones for his colleague agronomists as a way of monitoring their work and increasing their accountability.[252]

5.3.2.10.3. August 2012: In my meeting with the farmers in Santa Ana, I found that Mr. Odilón had recently used the images published by the farmers and himself on the project's web page to create a visual calendar of the MIAF system. The calendar indicated the different tasks that had to be carried out during a yearly cycle, each of which had its corresponding visual representation.[253]

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251 By that time, the name of the project had become established as *Los ojos de la milpa* among its participants and coordinators, although it was never subjected to public discussion.
252 Apparently, Dr. Ramos was having problems with some of the agronomists who implemented the MIAF system in different communities. As I learned later on, some of them were not carrying out their training duties properly, causing farmers to mistrust and ultimately abandon the MIAF initiative.
253 The visual calendar of the MIAF system created by Mr. Odilón is included in Appendix C.

Figure 28. Mr. Odilón discusses the visual calendar created with the images published by the participants of Los ojos de la milpa during an evaluation meeting in Santa Ana. Photo by Joana Moll in Santa Ana, Santa María Tlahuitoltepec, Mexico, 2012.

Again, the meeting with the farmers was one in which general topics outside the case study were initially discussed. Before the questions related to *Los ojos de la milpa* were introduced, Mr. Odilón spoke about the participative improvement of maize, an initiative aimed at developing varieties that could better adapt to the local topographical and climatic conditions, and which sought the participation of all farmers in Santa Ana. He also announced new government aid programs, focused on the construction of greenhouses and the production of deciduous trees. Farmers went on to discuss the issue of finding adequate markets for their peaches, obtained as a collateral benefit of the MIAF system. They identified specific problems: markets were already well established, and it was very difficult to enter them, as they were largely dominated by hoarders who lowered the price of peaches through speculation. We finally reached the topic of *Los ojos de la milpa*, and I suggested that all the issues that had been discussed on that day could also be documented and included in the *community manual*, as they were all relevant to the MIAF system.

The rate of publication of the group in Santa Ana remained very low, and Germán Vázquez explained that he had not shared the smartphone with other

farmers simply because nobody had asked to use it. He said he did not have enough time to interview other farmers or document their *milpas*, not even his own, and that he did not want to take all the pictures, as he had done so far. It became clear that the plan for sharing the smartphone by reciprocally distributing responsibility was not working, so I decided to modify it again. Instead of holding special meetings to exchange the smartphone, we agreed that it would be rotated among those who regularly attended meetings like the one we were attending, and could be used by anyone who was willing. I asked the farmers to decide whether they wanted to take part in this new plan. Germán and his brother Eustasio raised their hands, and also Mrs. Vitaliana Vázquez, who hadn't used the smartphone before, but was now asking for it. Despite the willingness to continue, the problem of when to meet arose. When I tried to find out when the next meeting would be held, so that I could keep track of the rotation of the smartphone, an hour-long discussion ensued. There was a great difficulty in matching the farmers' diverse agendas and their individual trips outside Santa Ana and, more generally, in deciding in which ways their failing association should be reorganized.

5.3.2.10.4. October 2012: I visited Juquila but, despite having previously fixed a date on which I could meet with the group, nobody was there except Mr. Odilón. Exactly the same thing happened in Santa Ana. Nevertheless, during my failed visits, Mr. Odilón told me that the MIAF initiative was facing severe organizational problems related to budgets and management. Dr. Ramos, the director of the initiative in Oaxaca, was growing old and tired and was looking for a successor. Mr. Odilón was hoping to take that position and he mentioned that, in case he became the director, he would provide smartphones to all of the MIAF technicians so that they could be used as means to monitor and control them, as he had previously suggested. According to Mr. Odilón, this would solve a number of current problems, such as technicians failing to carry out their jobs properly, or corrupt farmers who had been caught fraudulently selling the tree seedlings given to them for free as an incentive when joining the MIAF initiative. It became evident that the whole network of farmers who implemented the MIAF system was going through critical difficulties because of factors not directly related to agricultural issues: inefficiency, neglect, and corruption.

The participants in Juquila and Santa Ana had barely used the smartphones during August and September, very likely due to the fact that, during those months, the activity in the *milpas* normally decreased to minimum levels, but also because of the lack of interest in the project which, by that time, had become strongly explicit. Nevertheless, messages continued to be published sporadically on the project's web page. Therefore, I still expected the participants to resume sending messages to the project's web page in November, when maize would be harvested.

5.3.2.10.5. January 2013: After having tried and failed to encourage farmers in Santa Ana and Juquila to use, appropriate, and share the smartphones, in January 2013 I decided to bring *Los ojos de la milpa* to an end. Despite the fact that a small number of participants effectively published a significant number of messages during one year of activity, I strongly felt that most farmers in Santa Ana and Juquila were not really interested in the project, although they never said so clearly, and often even affirmed their interest in continuing. Therefore, I visited Tlahui on January 19th with the purpose of holding final meetings with the two groups of participants and collecting the smartphones I had provided.

In Santa Ana, Germán said that Mrs. Vitaliana, who had expressed her interest in using the smartphone, at some point asked for money as a compensation for publishing the messages she had recorded. The payment was obviously denied, and therefore Mrs. Vitaliana refused to carry on with her participation in the project. When I asked Germán his opinion about why the project had not gone well in Santa Ana, he replied vaguely, saying that the farmers there were very disorganized. Germán even showed some resentment towards Mr. Odilón, as he felt that he had abandoned them just when they needed his assistance. However, Mr. Odilón later told me that he thought Germán had already sufficient knowledge about the MIAF system, and therefore he considered that his training period was over. He also mentioned additional problems going on inside the association of farmers in Santa Ana, apparently related to unresolved debates over certain plots of land.

In Juquila, I found the meeting place empty. After a long wait, José Claudio

finally arrived. I learned that Froylán, the most active participant of that group, had been charged with the task of serving as a communal policeman and, consequently, had moved to downtown Tlahui. His dedication to such duties explained why he had stopped publishing messages on the web page. When I asked José Claudio why the project had not gone as expected in Juquila, he said that the farmers in Juquila simply never asked to used the smartphone. He also said that farmers no longer got together, and that the activities of their association had stalled indefinitely.

5.3.2.11. Significant messages published by the participants of *Los ojos de la milpa*.

Examples of significant messages published by the participants of *Los ojos de la milpa* are included in Appendix D.

5.3.3. Analysis of *Los ojos de la milpa.*

5.3.3.1. Messages published over time.

The participants of *Los ojos de la milpa* published a total of 372 messages between February 10, 2012, and January 19, 2013, with less than one message published per day on average. The following table shows the number of messages published by each group of participants during that period:

Group	Messages
Santa Ana	120
Juquila	152
PMSL	100
Total	**372**

Table 8. Number of messages published by the participants of Los ojos de la milpa. By Eugenio Tisselli, 2015.

Despite the fact that the two groups of farmers never met during the course of *Los ojos de la milpa* (and, if they did, it was outside the context of the case study), Santa Ana and Juquila show a remarkably similar volume of activity. The activity of group PMSL reflects Mr. Odilón's individual usage of the smartphone. The following graph shows the distribution of messages published by the participants of *Los ojos de la milpa* over time.

Messages vs. time
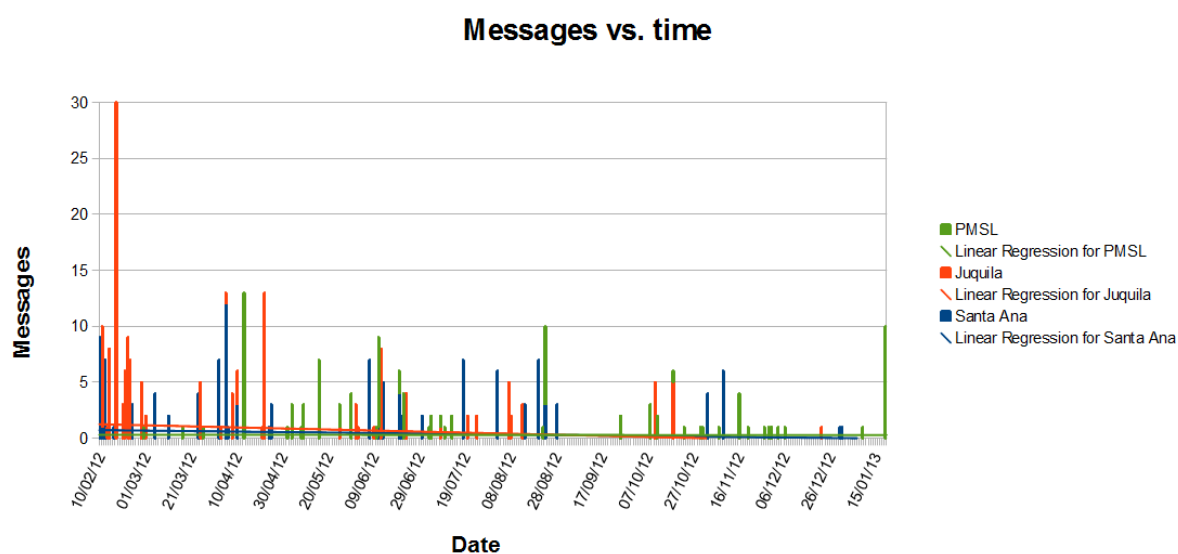
Chart 7. Publishing dynamics of the participants of Los ojos de la milpa over time. Linear regressions show that the amount of messages published by the three groups declined progressively. By Eugenio Tisselli, 2015.

This graph reveals that the volume of messages suffered from a constant decline. It features only four significant spikes that represent days in which more than 10 messages were published on the project's web site. The contexts of these spikes are described below:

- February 17th, 2012: A total of 30 messages were published by the participants in Juquila during a workshop on pest control and other topics related to fruit trees, conducted by Mr. Odilón.

- April 5th, 2012: The farmers in Santa Ana published 12 messages that document different issues regarding fruit trees, including an interview with a non-participating farmer from that community, while a participant in Juquila published one message depicting a religious celebration in Tlahuitoltepec.

- April 13th, 2012: Mr. Odilón posted a total of 13 messages showing different aspects of his work with the farmers of Rancho Esquipulas, a neighboring community in which farmers had also adopted the MIAF system.

- April 22nd, 2012: During a visit from Mr. Odilón, farmers in Juquila

documented different activities and issues in their *milpas*, including the planting of maize and the attacks of insects and birds that affected their peaches.

After April, the activity of participating farmers dropped significantly and continued to decline until the end of the project.

5.3.3.2. Tag-based analysis.

In order to examine the topics that were addressed during the project, as well as to analyze the intentions of participants, I will present a tag-based analysis of *Los ojos de la milpa* in the following paragraphs.[254]

5.3.3.2.1. Tags used by farmers.

From the beginning of the case study, I noticed that farmers in Santa Ana and Juquila were not using tags to describe their messages. Although each group had agreed on an initial set of common topics, which immediately became tags that could be selected to describe messages in the *ojoVoz* mobile app, throughout the project it became evident that farmers did not see the usefulness of adding a tag to their photos and sound recordings. Tags were not used despite repeated invitations to do so, and therefore I agreed with Mr. Odilón that he would use the editing section of the project's web page to add the appropriate tags to each message sent by the farmers *a posteriori*. Thus, the tag clouds found in the web page of the project do not represent shared vocabularies created by the farmers, but rather the individual classification of Mr. Odilón. Consequently, the tag clouds respond to his individual criteria, and not to the collective activity of the participants in Santa Ana and Juquila, as originally intended.

The farmers in Santa Ana originally chose a set of 8 tags, while those in Juquila chose 9. Although the meetings in which farmers chose their initial tags were separate, there were 6 coincidences between both sets, suggesting that the most salient topics related to the MIAF system were commonly identified by both groups.

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254 The tag-based analysis of *Los ojos de la milpa* followed the same principles and methods applied in *Sauti ya wakulima*.

However, as explained above, the tags that were actually used to describe the messages did not follow these sets strictly, as they were introduced according Mr. Odilón's criteria. Mr. Odilón used a total of 30 different tags. Nevertheless, 7 of the 8 tags chosen by the farmers in Santa Ana were included in Mr. Odilón's set, while all of the tags chosen in Juquila were included.

The following table shows the 12 most frequently used tags, that is, tags that Mr. Odilón used to describe at least 10 messages.

Tag	Frequency
frutales (fruit trees)	90
milpa	71
maiz (maize)	52
fertilizacion (fertilization)	46
poda (pruning)	41
siembra (sowing)	28
fumigacion (fumigation)	23
limpia (weeding)	22
plaga (pest)	19
prueba (test)	18
historia de tlahui (history of tlahui)	12
fiesta	11

Table 9. The most frequently used tags in Los ojos de la milpa. By Eugenio Tisselli, 2015.

The list of most frequent tags reflects that the messages published by the participants strictly followed the original objective of the project with only marginal deviations. The most frequently used tag, *frutales*, suggests that interest was largely focused on fruit trees, which constitute a novel element in the milpas and therefore also a relatively unknown one. Tags that describe techniques directly related to fruit trees, such as *poda*, *fumigacion,* and *plaga* also rank among the most frequently used. The second most documented topic was maize, together with its related practices: *milpa*, *fertilizacion,* and *siembra*.

All of the tags in this table refer to different techniques related to the MIAF system except *prueba*, *historia de tlahui,* and *fiesta*. The tag *historia de tlahui* presented some inconsistencies in its usage due to alternative spellings, which were subsequently bundled together as *historia de tlahui* using the tag grouping tool of the web-based platform.

The rest of the tags used by Mr. Odilón reflect different techniques of the MIAF system as well as other topics related to agriculture in Tlahui, such as *tomate* (tomato), *calabaza* (pumpkin) or *aguacate* (avocado). A special tag, *mezcal ayuujk* (Mixe mezcal), was used by Mr. Odilón to describe the preparation of the local beverage, a process that was documented by Froylán Vázquez from Juquila.

The following graph shows Mr. Odilón's cumulative usage of the most frequent tags over time.
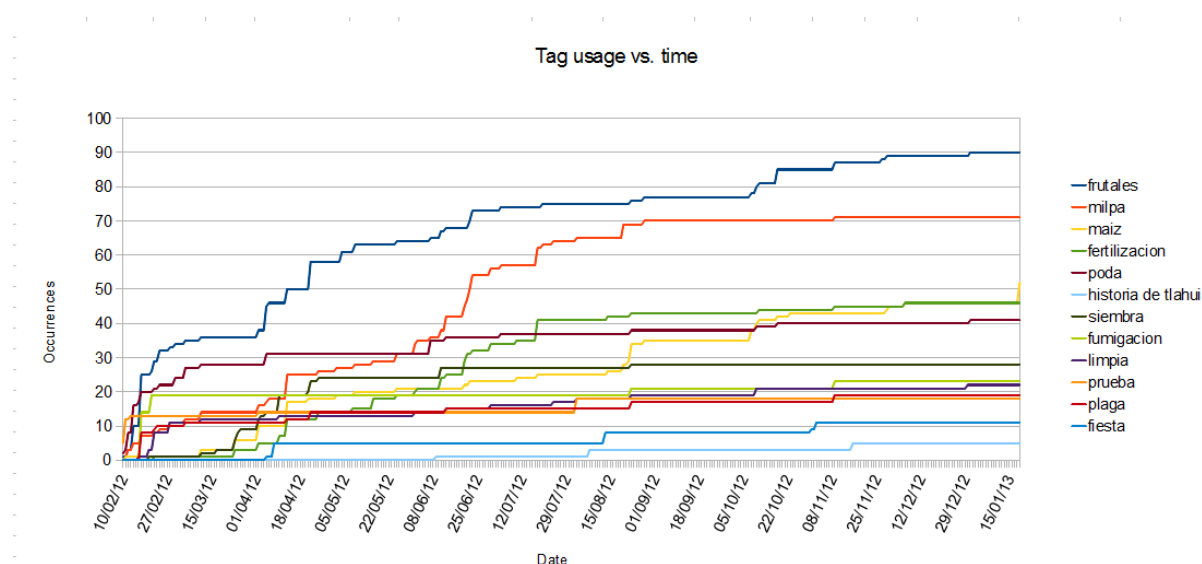
Chart 8. Cumulative frequency of tags used by Mr. Odilón to describe the messages published by the participants of Los ojos de la milpa over time. By Eugenio Tisselli, 2015.

5.3.3.2.2. Study tags.

In order to determine the different aims that the participants possibly had when using the smartphones, I followed the methodology of analyzing their messages using study tags, as I had done in the case study in Tanzania. However, for *Los ojos de la milpa*, I derived a set of only four study tags after carrying out the process of breaking the contents of the project into discernible categories. These study tags are described in the following paragraphs.

Knowledge: Messages in which a fragment of knowledge related to the

MIAF system or any other aspect of agriculture was explicitly shared. Sharing normally happened either through a vocal narration recorded by the farmer who published the message, an interview, or the recording of talks during assessments or workshops.

Opinion: Messages including a voice recording in which a farmer, either one of the participants or an interviewee, openly shared his or her opinion about an aspect of agricultural practice.

Meeting: Messages captured during the different meetings held by farmers. This tag covered the periodic meetings of associated farmers dealing with the MIAF system, workshops and training sessions, or other gatherings in which farmers received visits from representatives of the government or other organizations.

Problem: Messages that explicitly depicted a problem related to the MIAF system or other agricultural practices.

I applied these four study tags with the aim of determining the extent to which *reciprocal voice* might have been present in the aims and practices of the participants of *Los ojos de la milpa*. I derived only four study tags after observing that the contents published by the farmers were very restrained, not only in the range of topics that were covered, but also regarding the possible intentions with which they were captured. The tag *knowledge* describes messages in which farmers were willing to share their agricultural knowledge with others, and thus open up the possibility of a potentially reciprocal exchange. I had considered that knowledge about the MIAF system could become the core element in the creation of the *community manual*, which was the original goal of *Los ojos de la milpa*. In many cases, such knowledge was not limited to technical procedures, but often consisted in detailed accounts of the farmers' personal processes of learning. I posit that such rich offerings of knowledge mixed together with experience and individual views reflected a willingness to share, to include other farmers and help them learn about a system that might be potentially beneficial if properly implemented.

The study tag *opinion* became an important complement of the tag *knowledge*. This tag allowed me to identify whether agricultural knowledge coming from experts, such as the MIAF system, was being questioned by the farmers. This, in turn, allowed me to detect whether *voice* was being raised as a counterbalance to the authority of agronomists and, consequently, as a critique of the MIAF methodologies. However, not all messages tagged with this study tag reflect such acts of critical questioning, as in fact I found that many of the opinions expressed by farmers were mere expressions of acceptance of what experts such as Mr. Odilón recommended. Nevertheless, in a significant number of messages described with the study tag *opinion*, farmers did share their views, aspirations, and philosophy, and thus presented their subjectivity to others by speaking with a voice of their own.

After observing the contents published by farmers, I noticed that many of the messages depicted diverse meetings. Therefore, I used the study tag *meeting* to identify such messages and determine the types of meetings that the farmers had documented with the smartphones. The purpose was to find out whether those meetings could be an indicator of reciprocal practices being documented by the participants. I identified five different types of meetings:

1. Hands-on practice and training sessions delivered by Mr. Odilón or other experts in agriculture

2. Rituals and celebrations

3. Discussions about agricultural projects

4. Meetings with government agencies or other organizations

5. Periodic meetings of farmers related to the MIAF system.

More than half of the messages tagged with the study tag *meeting* were captured during the first type of gathering, that is, technical workshops and training. This could suggest that, rather than documenting reciprocal practices, the participants who captured those messages might have realized that the smartphones could become tools for recording and preserving the fleeting words spoken during such meetings, in which important knowledge about diverse agricultural practices was shared. Thus, the participants might have understood, to a certain extent, that

Los ojos de la milpa had the potential for becoming a platform for capturing and preserving knowledge. However, as the description of the project and its analysis suggest, this possible realization did not encourage them to become more actively engaged in the project.

Finally, the study tag *problem* allowed me to detect whether the project was perceived by the farmers as a means to communicate with experts by reporting the challenges they faced in their *milpas*. This study tag was the least frequently applied and, in many cases, participants who reported a problem also hinted at its solution, suggesting some degree of autonomy from the advice of experts. The reported problems revealed a complex scenario in which many elements fell outside the scope of expertise in agronomy, such as the occurrence of landslides, the high prices of fertilizers, scarcity of land, or evidences of the lack of efficient organizational strategies within farmers' associations.

The following chart shows the proportion of messages analyzed using the four different study tags.
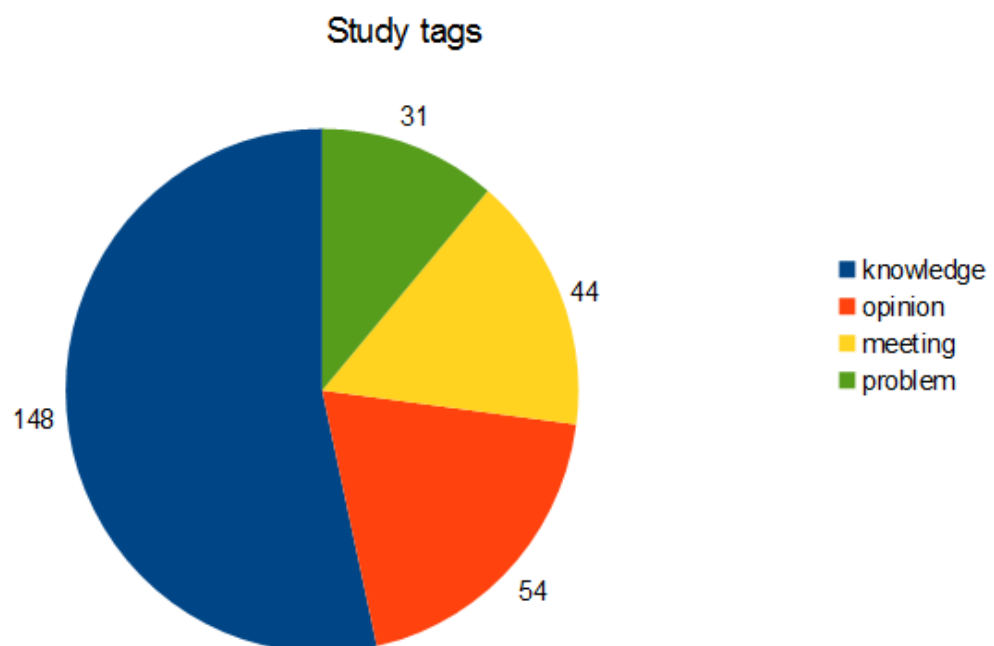
Chart 9. Distribution of study tags used to analyze the contents of Los ojos de la milpa. By Eugenio Tisselli, 2015.

5.3.3.3. Purposeful deviations.

The following table shows the number of messages that purposefully deviated from the original goal of creating a *community manual* of the MIAF system by documenting other topics. Because not all of the messages that deviated from the original goal were tagged by Mr. Odilón, the following table represents my own interpretation of the contents of those messages.

Topic	Number of messages	Usage examples
Fiesta	10	Day of the Dead, Celebrations of Patron Saint.
History of Tlahui	8	Forging of the local church bell.
Preparation of mezcal	8	
Local architecture, infrastructure	6	Houses, bridges, roads.
Natural environment	4	Rivers, springs, landscape.

Table 10. Number of messages that purposefully deviated from the original goal of Los ojos de la milpa. By Eugenio Tisselli, 2015.

The above table reveals that only 36 (9.6%) of all the messages published by the farmers deal with topics that differed from the ones originally agreed upon. This figure suggests that the original goal of the project was not significantly reshaped by the farmers, but rather augmented occasionally by documenting lateral topics. Messages that documented technical workshops related to the MIAF system or other agricultural practices, Mr. Odilón's on-the-ground technical assessments in Santa Ana, Juquila and other communities, or rituals carried out in the farmers' milpas were not considered off-topic. The rarity of purposeful deviations suggests that the ERV Methodology, as applied in *Los ojos de la milpa*, was not regarded by the farmers as a platform for making their *voices* heard beyond what was strictly asked from them, and therefore was not subjected to a critical transformation of its original purpose.

5.3.4. Conclusions for *Los ojos de la milpa*.

5.3.4.1. Failure of the reciprocal aspects of the ERV Methodology.

The description and analysis of *Los ojos de la milpa* shows that the ERV Methodology, as applied in Santa Ana and Juquila, largely failed to induce reciprocal behaviors, or to encourage participants to transform its goals and technologies for the purpose of amplifying their *voices*. Despite repeated attempts at finding different strategies for sharing the smartphones and organizing periodic meetings to discuss the contents of the project, the participation of both groups of farmers was extremely limited. In Santa Ana, Germán Vázquez, the local coordinator, kept the smartphone for almost the entire duration of the project and published practically all of the group's messages. Similarly, in Juquila, the smartphone never left the house of José Claudio Vázquez, who did not fulfill his role as coordinator. Nearly all of the messages published by that group were sent by his younger brother, Froylán Vázquez, who had to leave the project in September due to his communal duties.

But why did the reciprocal dynamics of the ERV Methodology fail, precisely in a social context in which reciprocity is considered to be a central guiding principle of social and political organization? As argued, the reciprocal aspects of *comunalidad* represent a living example of how mutuality may become a community's conceptual and practical framework. The fact that Tlahui is governed by the precepts of *comunalidad* initially led me to think that the reciprocal values of the ERV Methodology would resonate with the way in which farmers carried out their daily lives. However, the events that marked the development of this case study suggest that this assumption was not correct. I claim that the reciprocal values of the ERV Methodology failed to materialized because the potential benefits of *Los ojos de la milpa* never became clear to the participating farmers.

In *comunalidad*, reciprocity always happens around something concrete, something perceived as useful or necessary by the community, such as mutual work related to agriculture, the building of common infrastructures, or the organization of communal fiestas (Díaz, 2007). In other words, it may be posited that, in

comunalidad, reciprocity can emerge when it is closely linked to a *commons*. Therefore, because the process and outcomes of *Los ojos de la milpa* were not perceived as a *commons* by its participants, they did not find a concrete reason for organizing themselves reciprocally in order to nurture and sustain the project. The case of Mrs. Vitaliana in Santa Ana is a concrete example that may illustrate and support this argument. The fact that she did not publish the messages she had recorded using the smartphones because she wanted to be paid for doing so strongly suggests that, instead of understanding *Los ojos de la milpa* as a sociotechnical context by which a form of knowledge-based *commons* could be produced and preserved, she saw the project merely as labor that, correspondingly, had to be remunerated. If Mrs. Vitaliana had understood that the online *community manual* about the MIAF system was not meant to be appropriated by *foreign* scientific researchers, but could instead become an online and offline space for the sharing of knowledge to be shaped and managed by the community, it would not have made sense for her to demand a monetary compensation. Although I repeatedly stressed the fact that all activities and contents of *Los ojos de la milpa* were meant to be guided and appropriated by the participants, the groups did not take advantage of this opportunity.

Both in Santa Ana and Juquila, I detected a certain degree of mistrust triggered or even aggravated by the project, which in some cases became explicit. Particularly in Juquila, participants accused the local coordinator of monopolizing the smartphone, while he claimed that he always made it available to anyone who asked for it. This impasse prevented participation and sharing, and may even have introduced a minor conflict in the community.

The fact that *Los ojos de la milpa* failed to be regarded by its participants as a reciprocal process for the production of a knowledge-based *commons* may be analyzed as a set of concurrent factors. The first one was the way in which I implemented the ERV methodology. It is possible that, because of my short stays in Santa Ana and Juquila, I was not able to properly communicate the intentions and values of the project to the farmers. However, the local conditions in Tlahui, both in terms of social structures and technical infrastructures, largely played against the

adequate implementation of different aspects of the ERV methodology. Without avoiding my responsibility as a researcher, I claim that, despite attempting to find alternative ways to carry out the project, it was mostly external factors such as failing local organizations or poor connectivity that ultimately marred participation.

It is very likely that the lack of a solid social organization for discussing and managing the MIAF system played a significant role in the failure of the reciprocal aspects of the ERV Methodology. This deficiency was confirmed by the farmers themselves, who admitted that there was not a strong cohesion between them, despite the existence of common interests and a basic degree of trust. Periodic meetings in which farmers got together to discuss the MIAF system were very rare and, consequently, correlated meetings dedicated to discussing *Los ojos de la milpa* and sharing the smartphones almost never took place. In a personal communication, Dr. Juan Felipe Núñez, a researcher from the Postgraduate College who worked closely with the team of agronomists who originally developed the MIAF system, explained that the system was initially implemented under the rationale that, if it was adopted by community *leaders,*[255] other members of the community would eventually adopt it as well. But, according to Dr. Núñez, this hierarchical, top-down approach revealed its flaws when the supposed leaders actually tended to keep the new knowledge and techniques to themselves, instead of sharing them with others. After the first years, the crop yields in the *milpas* of the early adopters started to increase, a fact that triggered the jealousy of those who hadn't adopted the system. Dr. Núñez claimed that, because of this divisive process, the MIAF initiative could have introduced a certain degree of social disruption in the communities where it was implemented. Hence, the failing organizational structure of the farmer associations related to the MIAF system may be explained by the inadequacy of its original top-down implementation and its potentially disruptive effects.

An additional factor that played a significant role in the failure of the case study was poor network connectivity. As described, connectivity in Tlahui was

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255 Although Dr. Núñez did not know the exact criteria applied to choose those community leaders, he claimed that farmers who quickly adopted the technical innovations developed and deployed by agronomists from the Postgraduate College were considered to be strong candidates to lead new initiatives. The criteria for identifying community leaders was not clarified in subsequent interviews with other researchers at the college.

severely limited because of insufficient technological infrastructure in a topographically uneven terrain. The assumption that the farmers who participated in *Los ojos de la milpa* ultimately did not see the usefulness of creating an online community manual may be closely related to their lack of access and familiarity with the Internet. However, most participants in Santa Ana and Juquila were young people who claimed to be Internet users and who regularly accessed the network through a satellite link connection available in Tlahui. Therefore, while poor connectivity was certainly a problem, it might have been a secondary one: if *Los ojos de la milpa* had raised sufficient interest among its participants, especially younger ones, they could have overcome the local technical limitations. This observation may further support my claim that the participants of the project failed to see the potential of the smartphones and the Internet for becoming a platform to produce, preserve, and share valuable knowledge about the MIAF system and other related topics.

5.3.4.1.1. The Oaxacan farmers' hybrid outlook on technology.

The relatively recent arrival of information and communications technologies in Tlahui might have prevented farmers from fully understanding the implications of *Los ojos de la milpa*. However, an additional and perhaps more significant factor that influenced the negative outcome of the case study was a general attitude that Mr. Odilón characterized as a "pragmatic approach" to technology. According to Mr. Odilón, farmers in Tlahui showed a strongly pragmatic approach to new technologies: if they yielded quick and concrete results, they adopted them; if they didn't, they were quickly discarded. If such an observation is accurate, it may have complex, even paradoxical implications. On one hand, the farmers' pragmatic approach might be considered as a healthy antidote against technological determinism. It is possible to think that, when technologies are regarded as tools that must serve a concrete and necessary purpose, and are therefore bound to their usefulness rather than their ideological values, they may be more readily contextualized and transformed. The pragmatic transformation of technological artifacts, in turn, may yield a sort of creativity which, unfortunately, was only briefly

263

portrayed in *Los ojos de la milpa*[256].

Figure 29. In this picture, a farmer in Tlahui who created an improved plow by assembling different parts of discarded metal artifacts is interviewed by a participant of Los ojos de la milpa. Photo published by a participant of Los ojos de la milpa in Santa María Tlahuitoltepec, on April 11, 2012.

Anthropologist Roberto González quoted a farmer he met in Oaxaca during his research: "Here in the countryside, everything has a use. Smart *campesinos* don't throw away anything" (González, 2001, p.88). However, the additional observations of González refine and ultimately contradict the farmers' supposedly pragmatic approach to technology, and therefore their potential immunity against technological determinism. As he recounted, the farmers he met in Oaxaca had a fascination with new technologies, and they wanted to see "as much technology as possible introduced" into their community, and "as quickly as possible" (González, 2001, p.60).

On the other hand, agronomists and researchers working together with farmers also participate in this complex mixture of pragmatic and aspirational attitudes towards technology. As far as I could attest, experts tended to develop

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256 The following message, published by Mr. Odilón in June 2012, features a farmer discussing how he could use spare metal parts to transform and improve an iron plow: http://sautiyawakulima.net/oaxaca/oaxaca.php?c=3&date=2012-06-11&from=0&l=2#289 (retrieved 29.01.2015)

264

technologies that responded to such attitudes, that is, technologies capable of rapidly delivering positive results, often without regard to their possible negative effects on the environment or other spheres of the farmers' livelihoods. Such a scenario, in which new technologies must necessarily satisfy the expectations of immediate benefit, may be described as *solutionism*. I found that, to a large extent, *solutionism* was at play in the MIAF system, as its guidelines encouraged the usage of agrochemical fertilizers that, despite yielding immediate increases in crop production, also increase the acidity of the treated soils in the long run and have the potential to trigger economic dependence.

However, I also found that this sort of pragmatism and its correlated *solutionism* were tempered by a desire to use technology to maintain a more reciprocal relationship with the natural environment. According to González, the generation of farmers in Oaxaca that developed its activities before the 1960s did not use agrochemical fertilizers, simply because they were not available (González, 2001). In a personal conversation, Mr. Odilón also recalled how his father never used agrochemicals in his milpa.[257] The observations of González and the remarks of Mr. Odilón were further confirmed by a message sent by Froylán Vázquez from Juquila, in which the voice of an elderly farmer recalls how, in his times, maize grew well without agrochemicals.[258] It was also Froylán who expressed his satisfaction after seeing that his maize plants had grown strong after applying mycorrhizal fungi, an organic fertilizer made from naturally occurring beneficial soil organisms. Thus, it may be possible to assume that a certain desire to return to older, more sustainable and reciprocal techniques may exist among the farmers in Tlahui. As Mr. Odilón said, those farmers were currently passing through a time of transition in which fewer agrochemicals were used, in contrast with the Green Revolution's heyday, while more sustainable alternatives were being researched and applied.

To summarize, I suggest that farmers in Tlahui might be characterized by a

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257 I asked Mr. Odilón why agrochemicals had become necessary in an agricultural context where, for many generations, they had not been used at all. He replied that the previous generations used to grow maize through slash-and-burn agriculture. However, this technique was no longer used because of the dangers presented by its correlative deforestation, and therefore agrochemicals were eventually introduced.

258 The referred message may be accessed at http://sautiyawakulima.net/oaxaca/oaxaca.php?c=3&date=2012-06-23#305 (retrieved 02.02.2015)

hybrid outlook on technology, partly guided by pragmatism and *solutionsm*, but also partly by an aspiration to restore reciprocity and achieve environmental and economic sustainability. However, despite the possibilities offered by such a hybrid and somewhat paradoxical perspective, the farmers in Santa Ana and Juquila failed to materialize the potential of the technological tools of *Los ojos de la milpa*. Perhaps, as with agrochemicals, the participants of the case study preferred to produce, preserve, and share their knowledge about agriculture using technologies and methodologies that were closer to their current sociotechnical context (which, despite its transitoriness, was one in which smartphones and the Internet were still seen as foreign artifacts), rather than adopting and reshaping the new ones proposed to them.

5.3.4.2. The relative success of *Los ojos de la milpa*.

Nevertheless, the original goal of creating a *community manual* of the MIAF system was accomplished to some extent, despite the general lack of participation and weak involvement of the farmers in Santa Ana and Juquila. The resulting *community manual* is, of course, different from the printed manual created by the experts from the Colegio de Posgraduados: while it may not be as detailed or precise, it partially integrates the views and, most importantly, the language and *voices* of a small group of farmers. Furthermore, as discussed, the project was marginally appropriated by farmers to make their *voices* heard. This may be confirmed by the contents of some of the messages tagged with the study tag *opinion*, or by those that depict purposeful deviations.

Ultimately, and somewhat unexpectedly, *Los ojos de la milpa* was well received by broader audiences both within and beyond the community of Tlahui. The project was widely disseminated after all the voice recordings on the web page were transcribed and translated into Spanish and English. Such acts of transcription and translation rendered the *voices* of the farmers accessible and readable and provided those who do not speak the Mixe language with a glimpse to certain fragments of the knowledge and worldviews of the farmers in Santa Ana and Juquila.[259]

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259 The transcription and translations of the voice messages was carried out by a group of young linguists living in the Mixe

5.4. Conclusions.

In this chapter I have described, analyzed, and discussed the outcomes of the case studies *Sauti ya wakulima* in Tanzania, and *Los ojos de la milpa* in Mexico. As discussed, the purpose of these projects was not that of offering practical solutions to the challenges faced by small-scale farmers, but rather to create spaces of socialization where knowledge about agriculture could be produced, shared, and exchanged. Such spaces were also intended to become autonomous spheres of agency where *reciprocal voice,* as well as the farmers' appropriation and transformation of research goals and methodologies, could be fostered and valued. The case studies attempted to activate reciprocal flows of *voice* as a way to enact and disseminate the immanent biopolitical potency, the *unimaginable outside* constituted by the alternative subjectivities of small-scale farmers, in the face of impending economic and environmental risks in their communities.

5.4.1. Questioning the ERV Methodology.

The successes and failures of the ERV Methodology, documented in detail in this chapter, allow its principles and processes to be questioned. In order to determine which aspects should be questioned, I will discuss the influence of two implicit factors of the methodology: presence and coercion.

My stays in Bagamoyo and Tlahui were generally short, often lasting for only one or two days. I consistently limited the duration of my presence with the intention of preventing it from overdetermining the development of the case studies.[260] And, during my visits, I always tried to optimize my short meetings with the farmers by conducting interviews, evaluations, and training sessions and providing technical

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region, who call themselves COLMIX (Colegio Mixe). Members of COLMIX, including Tonantzin Díaz, participated in the public presentation of Los ojos de la milpa, celebrated in the city of Oaxaca in August 2013. Froylán Vázquez, the most active participant in Juquila, also took part and, after that date, he continued to use the smartphone to publish messages on the project's web page. At the time of writing, all of his messages had been dedicated to document the history of Tlahui and, interestingly, none have dealt directly with the MIAF system.

260 In anthropological fieldwork, reflexive methods acknowledge that the very presence of the researcher might yield significant and potentially distorting effects on the research. This principle was perhaps first thought of by William Thomas, as the "Thomas Theorem" (Schultz, Lavenda, 2009). The ERV Methodology implicitly integrates such awareness, and therefore prescribes local coordinators and periodic evaluation meetings instead of asking researchers to remain present in the community where it is implemented.

support, all of which are methods of the ERV Methodology. However, whereas in Bagamoyo such short visits were probably enough to maintain and periodically revitalize the dynamics of the project, locally led by Mr. Hamza in an efficient and dedicated way, the project in Tlahui might have benefited from longer stays. Perhaps if my visits to Santa Ana and Juquila had been longer, I could have compensated for the lack of autonomous organization by dealing with the organizational aspects of the methodology more directly. For instance, I could have tried to put a stronger pressure on participants to get together to discuss the project and share the smartphones. Nevertheless, I believe that this would have undermined the core purposes of the ERV Methodology: helping a group establish a shared communicational praxis around a knowledge *commons* and strengthening reciprocal relations through responsivity, both of which require a high degree of autonomy from the researcher's top-down and potentially distorting activity.

I could also have tried to apply coercive measures during the case study in Tlahui, for example by excluding from the project those who failed to publish messages or share the phone with others. Such measures would have been coherent with the principles of strong reciprocity as well as with those of *comunalidad*, and might have contributed to obtain more consistent results. But the approach of the ERV Methodology seeks to induce the reciprocal exchange of *voice* through responsivity, rather than imposing it through coercion. Furthermore, coercion in this particular case might have been interpreted by the community as a top-down dictate from a *foreign* researcher, given the rather suspicious attitude I perceived throughout my visits. Therefore, I decided to accept the lack of involvement of the participants in Tlahui as an opportunity for questioning certain aspects of the ERV Methodology, rather than directing or forcing them towards a specific goal.

To summarize, two of the apparent shortcomings of the ERV Methodology— the limited presence of the researcher and the lack of coercion—might also lead to the questioning of its very goals and principles. Therefore, rather than transforming the methods of the ERV Methodology, it may be necessary to take advantage of their open-endedness in order to find context-sensitive strategies that may enable their implementation in socially or technically challenging scenarios. Such adaptation

strategies cannot be determined in advance because of their highly specific contextual method. However, their implementation may happen within the methodological framework provided by the ERV Methodology, which may act as a set of guidelines to be transformed and adapted to varying situations. Under this perspective, I claim that, beyond the influence of external factors, the relative failure of *Los ojos de la milpa* was due to my limited capacity to devise and implement appropriate adaptation strategies.

5.4.2. Refining technical aspects of the ERV Methodology.

The technical process to identify the messages published by individual participants of the ERV Methodology needs to be further refined. Because the information about the sender's identity was not available, it was impossible for me to determine who had published any particular message. This lack undermined the analysis of the case studies and prevented me from studying the participation of farmers in greater detail. Thus, I was not able to accurately analyze the extent to which the smartphones were effectively shared and used by different participants nor to compare the individual volumes of messages or associate the creation of new tags with specific individuals. It is therefore necessary to improve the software applications of the ERV Methodology so that they may include information about the identity of a message's sender.

Although the smartphone and web-based applications enable the georeferentiation of messages and thus open up the possibility of collaborative mapping, maps were either not relevant or not wanted in Bagamoyo or Tlahui. In Bagamoyo, messages with associated geographical data are shown on an online map; however, this feature has not yet proved to be relevant in any way for the participants of the project or even Mr. Hamza and his colleagues at the Agricultural Office. In Tlahui, after I initially explained the project to the community, I was explicitly requested to disable the mapping capabilities of the applications. The community was concerned about the potential dangers of mapping a territory that, as I eventually learned, was partially subject to long-lasting and potentially violent disputes.

The usage of study tags as tools for content analysis needs to be refined as well. While associating study tags to individual messages may be a simple and immediate qualitative method to identify the general intentions and interests of the participants, it is also a reductionist one. As I applied the study tags, I realized the enormous complexity of the content published by the participants of the case studies, particularly in Tanzania. Although the study tags revealed, in that case, that participants were actively weaving a net of social relations and sharing knowledge to better cope with diverse challenges, they don't reflect the full complexity of what the farmers published. Perhaps my usage of study tags was constrained to too few of them and, by creating a more extensive set, or by defining them together with the participants, I could have reached deeper, more nuanced conclusions. It is hoped that these challenges can be met in future work by myself and other researchers.

6. Conclusions.

In this dissertation, I have attempted to investigate whether the reciprocal exchange of *voice* could be encouraged in small-scale farming communities by the transformation of information and communications technologies, artistic intervention and *cross-community research*. I will offer answers to the main research questions that were posed in the introduction of this dissertation, while contrasting the conclusions of each chapter with the outcomes of the case studies, in order to determine the extent to which the methodological and practical aspects of this dissertation have been reflected by the theoretical contextual background.

6.1. Can the reciprocal exchange of *voice* be encouraged in small-scale farming communities by the transformation of information and communications technologies, artistic intervention and *cross-community research*? And what is the relevance of this task?

By looking at the outcomes of *Sauti ya wakulima*, I have suggested that the reciprocal exchange of *voice* may indeed be encouraged. Encouraging *reciprocal voice* is important in small-scale farming communities because it can become a strategy that may help farmers to reinforce their resilience through an active exchange of knowledge about their *commons*, to achieve political recognition, and to strengthen their standing against values and practices that can be potentially harmful to them.

It might be argued that a crisis of *voice* and values rooted in the abstraction of labor and economic value, such as the one described in chapter 1, should not necessarily affect small-scale farmers, since their everyday practices and forms of exchange are firmly rooted in the concreteness of their bodies and their territories. However, neoliberal models of agriculture and their potentially disruptive effects, discussed in detail throughout this dissertation, are rapidly gaining ground even in the most remote regions of the planet. Therefore, I suggest that small-scale farmers may need to find strategies to strengthen reciprocity in their communities in order to

better manage and sustain their *commons* while defending them from exploitative agricultural practices. Correspondingly, they might also need to apply those strategies to strengthen their *voices* in order to enhance their visibility and recognition in both local and wider political contexts.

In chapter 3, I concluded that the progressive devaluing of *voice* and reciprocity in small-scale farming communities could be counted among the negative aspects of the progressive subjection of agriculture to commodification and technological *solutionism*. In order to create alternatives to such scenarios, the need for sustainable economic, social, and ecological values and practices in agriculture arises. I claimed that such values and practices can emerge from the reciprocal forms that still persist in different small-scale farming communities. However, I also argued that some of those communities may experiencing hybrid scenarios where reciprocity tensely coexists with monetized economies, the compulsion to compete, and the allure of entrepreneurship.

Therefore, I suggested that it could be beneficial to emphasize and strengthen *reciprocal voice* as a form of resilience and resistance in those scenarios. Indeed, many farmers want to increase their productivity and boost their income. But should they do it at the price of sacrificing the richness of their cultures, the cohesion of their communities, or the resilience of ecosystems? Such decisions should surely be left to those farmers and their communities. Nevertheless, because of the subtlety and pervasiveness of the processes of induction by which economic and technological behaviors become internalized, I claim that it may be worthwhile to carry out methodological strategies that can offer farmers the insight into the different aspects and implications of neoliberalism, if only to help farmers see its intrinsic nature more clearly and expand their information for decision-making processes.

During the case studies in small-scale farming communities in Tanzania and Mexico, I found scenarios in which reciprocity existed side-by-side with individualism. Because of the strong influence of self-interested competition, entrepreneurship, and technological *solutionism*, induced through all sorts of initiatives and programs conceived within the sphere of neoliberalism, reciprocity

and its associated practices are in danger of being significantly undermined. In Tanzania, farmers who participated in *Sauti ya wakulima* showed their willingness to regard knowledge as a *commons* by actively sharing and exchanging it; however, they also repeatedly expressed that they wanted to become successful (and therefore competitive) *entrepreneurs*. Similarly, in Oaxaca, I worked in a context in which *comunalidad* is not merely regarded as an abstract political notion, but rather as an everyday practice articulated through assemblies, mutual work, and reciprocal attitudes towards humans and ecosystems. Yet I also found rivalries and competition, as well as episodes of corruption and division.

Finding such hybrid scenarios was a sobering realization that prevented me from idealizing small-scale farming communities as frictionless reservoirs of reciprocity. But it was also a significant observation, and it suggested that, because those small-scale farming communities are currently passing through a transitional state between reciprocal forms of organization and individualist competition, reinforcing reciprocity and the value of *voice* as a biopolitical instrument might be a way of resisting the negative effects of neoliberalism on agriculture. Thus, the case studies sought to be more than merely participatory research initiatives: they were also attempts to induce the value and practice of *reciprocal voice* among small groups of farmers. The outcomes of the case studies show that those attempts achieved a certain success in Bagamoyo, but failed almost completely in Tlahui where, nevertheless, an online *community manual* was finally produced.

When facing large-scale social and ecological challenges, a number of cultural researchers have claimed that, besides technical or scientific solutions, what is needed is an attitudinal shift: a transformation of behaviors and values. For instance, Naomi Klein wrote that in order to adequately respond to the challenges posed by anthropogenic climate change, "we will need to start believing, once again, that humanity is not hopelessly selfish and greedy: the image ceaselessly sold to us by everything from reality shows to neoclassical economics" (Klein, 2014, p.461). Likewise, the renowned writer Margaret Atwood pointed out the links that exist between moral and cultural values and energy systems based on fossil fuels, a major cause of anthropogenic climate change (Atwood, 2015). Observing the fragility of

those values against the overpowering influence of economic growth and the energy systems that fuel it, she suggested that reciprocal attitudes and behaviors that persist despite the prevalence of self-interested competition, could disappear upon the quick onset of a crisis, such as a future without oil (Atwood, 2015). In resonance with her suggestion, I have tried to address the question of how to strengthen reciprocity in face of the looming challenges of climate change.

Moreover, the political strategies followed by the Vía Campesina movement, as discussed in chapter 3, emphasize that moral discussions, regardless of how dilated or complex they may be, should not be avoided in times of looming peril. Those strategies may be specifically understood as attempts to put values at the center of global discussions and political negotiations about food production, with the purpose of shifting it towards more reciprocal, equitable, and resilient models. This is expressed in the movement's notion of *food sovereignty*.

The relevance of encouraging the moral principle of reciprocity in agriculture should become sufficiently clear upon examining the threats that mainstream models based on productivity and competition may pose. However, morality is highly dependent on cultural contexts, and therefore the concept of *reciprocal voice* cannot be automatically universalized, although it may be fruitfully disseminated and adapted. Thus, beyond the potential benefits that the strengthening of *reciprocal voice* might bring to small-scale farmers, I believe that the dissemination of access to this exchange is important, particularly in these times. Consequently, I have discussed the methodological and practical aspects of this research with the general public in conferences, talks, and articles, hoping that they may contribute to a wider recognition and revaluing of the knowledge held by small-scale farmers, as well as their reciprocal values and practices.

The remaining research questions clarify how *reciprocal voice* may be strengthened through a *cross-community research* methodology for artistic intervention that includes the transformation of information and communications technologies.

6.2. Is it possible to design and implement an open-ended sociotechnical methodology to effectively achieve that goal?

The effective reinforcement of *reciprocal voice*, enacted by the participants of *Sauti ya wakulima*, led me to design the ERV Methodology: a sociotechnical methodology to encourage the reciprocal exchange of *voice*. However, its subsequent application in the second case study, *Los ojos de la milpa*, clearly showed that the ERV Methodology could not be implemented as a recipe, but rather as an open-ended set of guidelines that must be contextualized at every step.

Imposing the values of *voice* and reciprocity (or any other value, for that matter) through the application of a set of coercive methodological procedures is neither possible nor desirable. Instead, I have argued that such values might be induced and strengthened through social responsivity, and that they must always meet with the acceptance and willingness of the community where their adoption is proposed. I also claimed that, in order to strengthen the reciprocal aspects of *voice*, it might be necessary to construct *enabling spaces* such as those I attempted to create in the case studies, rather than merely multiplying the technological channels for making *voices* heard. Furthermore, the community's appropriation of the goals and methods of the ERV Methodology should be fostered so that the strengthening of *reciprocal voice* may emerge in a bottom-up fashion, that is, as an initiative of the participants, and not as a top-down dictate of researchers.

I claim that the ERV Methodology may be understood as a possible framework for an *organized network*, a concept that emerged in the sphere of digital media art. As discussed, *organized networks* attempt to integrate a network-based model of political organization with concrete, peer-to-peer encounters. Although the ERV Methodology was not designed after the model of *organized networks*, its methods largely agree with two of the model's core principles: gathering and forming a group, and establishing a horizontal, participatory practice. Moreover, as discussed in chapter 2, *organized networks* offer the potential to create non-representative platforms for the collaborative production of knowledge. Correspondingly, the case studies, particularly *Sauti ya wakulima*, indicate that the principles included in the

ERV Methodology might be fruitfully applied to help a particular group generate and share knowledge.

Geert Lovink, one of the proponents of *organized networks*, identified a number of questions related to the practical implementation of the concept:

"What are the protocols that structure organized networks? What are the modalities of self-organization? How can organized networks scale up? And how sustainable are these networks, presuming that they will not … have access to ordinary financial resources?" (Lovink, 2014, p. 108).

As I designed and implemented the ERV Methodology, I found myself asking these same questions. Practically all the steps of the methodology are dedicated to the establishment of the protocols and modalities of self-organization that may guide a group through the process of reciprocal exchange. However, the third and fourth questions remained unanswered. As discussed, the scaling up of *Sauti ya wakulima* by integrating farmers from Zanzibar failed and, in part, it did so because of insufficient funding. Therefore, I suggest that the future refinements to the ERV Methodology will need to closely follow those of *organized networks*.

Lovink formulated an additional question: "What long-term cultural transformations might emerge from networked interactions?" (Lovink, 2014, p.108). This question is also relevant to the ERV Methodology and its practical application. In this dissertation, I have posited that *reciprocal voice* can become the moral nucleus of a broader cultural shift that, in its emergence, may pose an alternative to the hegemony of technological and economic rationalities that undermine or disrupt communities. Consequently, I designed and applied a methodology that could contribute to the strengthening of *reciprocal voice.* However, this analysis can only be sought by a longer span than the period included in this research. A longer period of time would allow me to verify whether those values were lastingly reinforced or not.

As a form of *cross-community research*, the ERV Methodology attempted to

engage members of other communities into the case studies. However, these attempts largely failed to engage those communities, including the scientific researchers that worked closely with the small-scale farmers. As discussed in chapter 3, scientists tend not to value the *voices* of small-scale farmers in a reciprocal way; therefore, I posit that greater efforts must be made within the scientific community to interweave farmer-held knowledge with their own research. During the course of the case studies, I observed the need to foster and strengthen the collaboration between scientists and small-scale farmers. I understood that the traditional knowledge and practices of small-scale farmers do not always yield effective results and, in many cases, can not be considered as ecologically resilient. In those cases, the intervention of scientists, particularly from the field of agroecology, might greatly benefit small-scale farmers. Conversely, the development of scientific projects that are subsequently applied in small-scale farming communities are not always informed by rich contextual data, much less by the needs or values of farmers. When such a lack of reciprocal communication between small-scale farmers and scientific researchers arises, the ERV Methodology may be used to encourage the synergy between those communities. However, given the fact that such a purpose failed to materialize successfully in this research, it is possible to conclude that additional strategies for intensifying this synergy may need to be developed.

6.3. What may be the role of information and communications technologies in such methodology?

In the ERV Methodology, mobile phones and the Internet are used as tools to encourage the reciprocal exchange of *voice*. However, I have claimed that the usage of those tools can become more effective if they are used in a transformative way. Transforming the modes of usage of mobile phones and the Internet can be achieved through a process of rewriting the values inscribed in them. As discussed, information and communications technologies may be regarded as a focal point in which some of the core values of neoliberalism are synthesized: individualism, self-interested competition, and *solutionism*. Therefore, the act of reinscribing those technologies with alternative values might be considered as a political struggle that is fought on contested territory.

In chapter 4, I focused on the field of e-agriculture with the purpose of carrying out a close examination of the potential benefits and risks of the application of information and communications technologies in small-scale agriculture. I concluded that, in the mid and long terms, the risks posed by most e-agriculture initiatives could override their benefits. This assessment was the outcome of a value-based analysis, and therefore included potential risks such as a further silencing of the *voices* of small-scale farmers, leapfrogging basic learning of agriculture, eroding reciprocal practices, or creating new forms of dependency on inputs such as electricity or telecommunications services. However, I claimed that, by shifting the implicit values that seem to prevail in e-agriculture, namely commodification and *solutionism*, the field could be reoriented towards more sustainable goals, including the strengthening of reciprocity and *voice*. I also posited that rewriting the values embedded in mobile technologies might contribute to form the basis for a *reciprocal rationality*: a mode of thinking that might permeate everyday behavior and encourage people to speak and act more reciprocally.

The ERV Methodology attempts to reinscribe information and communications technologies with a *reciprocal rationality*. At first sight, the phone-sharing scheme of communication and social dynamics proposed in the ERV Methodology might seem counter-intuitive. After all, if the goal is to help a community to project its *voice*, why not provide a device for every person involved? Indeed, the individual distribution of phones would very likely result in more efficient outcomes than their shared usage. However, I claim that, by concretely transforming the mobile phones into communal tools, the ERV Methodology has the potential to encourage a shared, responsible usage, and therefore may help to establish a communicative praxis based on reciprocity. The person who at any given moment uses one of the phones not only has to take good care of it, since it belongs to the entire group, but may also feel responsible to act in an engaged way, and therefore use it to document issues that will be relevant for all. Thus, by attempting to transform the usage of information and communications technologies, the ERV Methodology seeks to embody the claim that the conscious rewriting of reciprocal values in technologies may encourage a *reciprocal rationality* in the context where

those technologies are transformed. Such acts, which may be described as active transformations of sociotechnical systems, may not only be understood as being inherently political, since they attempt to reshape and challenge hegemonic rationalities, but also as ethical endeavors.

As discussed throughout this dissertation, the creative freedom afforded by information and communications technologies and the attractiveness of *solutionism* often advocated by technological enterprises can become a set of empty and potentially damaging exercises if they are not firmly rooted in ethical values. Therefore, I claim that breakthroughs in technology need to emerge from the sphere of ethics[261] as much as they do from the field of engineering. But which are the values that may give new meanings to technologies, while posing alternatives to *solutionist* modes of thinking? In this dissertation I have argued that reciprocity and *voice*, interwoven into the notion of *reciprocal voice*, might be a viable option for the biopolitical construction of those alternatives, and that the ERV Methodology can be a means to encourage it.

Understanding information and communications technologies as components of sociotechnical contexts.

I claim that the participants of *Sauti ya wakulima* transformed the sociotechnical setting that was originally proposed to them into a platform for the exchange of *reciprocal voice*. This occurred because the participants themselves activated a process of socialization as well as sharing their knowledge about their *commons*. Even if the reciprocal rotation of communal phones was not fully understood or respected in Chambezi, *reciprocal voice* was manifested through the participants' eagerness to openly learn and share knowledge with others. Through their act of resignifying the technological tools and research objectives, the participants of *Sauti ya wakulima* enriched the project with values that differ to those usually found in e-agriculture initiatives, as discussed in chapter 4. As a result,

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261 In this dissertation, I have attempted to argue in favor of reciprocity, a moral principle. However, the call for ethical breakthroughs in technology does not imply that *morality* and *ethics* are used interchangeably. Nevertheless, it is important to acknowledge that morality often plays a crucial role in formulating ethical theories (Gert, 2015). Consequently, the moral value of reciprocity may become the basis for an ethics of reciprocity: in the case of technology, one that may act as a general code for the design and manufacture of technologies guided reciprocal principles.

the participants highlighted the importance of sharing knowledge and carrying out truly participatory research instead of merely using prepackaged, *solutionist* information services with short-term, utilitarian purposes.

However, in the case of *Los ojos de la milpa*, the open-endedness of the ERV Methodology might have bred a sense of confusion and might have ultimately prevented the participants from seeing its potential outcomes as a *commons*, or regarding it as a platform for the activation of *reciprocal voice*. While face-to-face meetings became well established in Chambezi, a complex set of factors (discussed in chapter 5) prevented the participants in Tlahui from getting together to discuss the goals and contents of the project.

Such significant contrasts between both case studies lead me to suggest that the ERV Methodology must be contextualized according to the features of the sociotechnical environment where it is applied. The methodology might work best when applied within communities that are well established and willing to act reciprocally, and to make their *voices* heard. Moreover, the methodology might be met with a greater acceptance in sociotechnical contexts where there is a shortage of technological channels for disseminating *reciprocal voice* throughout the different levels of the social and political spectrum.

In Chambezi, the participants were already part of a cooperative and, possibly because of their strong need to acquire new agricultural knowledge that could help them improve their livelihoods and cope with diverse challenges, were also willing to share knowledge reciprocally. Furthermore, because of their diverse needs and lacks but, perhaps more significantly, because of their remoteness from hubs of communication and political decision-making, they were also willing to appropriate and use technologies that could amplify their *voices*.

Contrastingly, participants in Tlahui were members of a failing agricultural initiative that, as explained, may have brought some degree of social disruption to the structure of their community, because it was originally implemented in a top-down fashion. Thus, by the time I contacted them, the dynamics that had formed

around the MIAF system might have prompted a divisive tendency that hampered collaboration. However, paradoxically, those farmers were also actors in a political system with established reciprocal practices guided by the principles of *comunalidad* in which, at least ideally, all *voices* should be heard and valued. Perhaps, in such a context, attempting to induce the values of *voice* and reciprocity could be seen as a rather naive or even unnecessary endeavor.

The failure of the ERV Methodology in Tlahui might have been related to the way in which it was implemented but, as argued in chapter 5, it was most likely due to contextual influences, such as the lack of cohesion and trust within the community, or poor connectivity. Thus, the outcomes of *Los ojos de la milpa* clearly point out the need to refine the ERV Methodology to better cope with adverse sociotechnical conditions, and to make it available for adoption by diverse communities.

6.4. To what fields of knowledge and research may such methodology contribute?

The methodological and practical aspects of this dissertation may significantly contribute to the fields of e-agriculture, agroecology, farmer participatory research and socially engaged art. However, I have designed the ERV Methodology as a flexible and appropriable set of sociotechnical methods and technical platforms that may enhance other types of *cross-community* research and intervention. Therefore, I claim that the contributions of this study are not limited to specific disciplinary fields; instead, they can be applied in diverse contexts in which the collaborative production of a knowledge commons is regarded as a factor that may strengthen the standing and resilience of communities at risk of exclusion.

Cross-community recommendations for future research.

An interface between e-agriculture and agroecology.

A significant contribution of the ERV Methodology is its potential to act as an

interface between the fields of e-agriculture and agroecology. As argued, the design of future e-agriculture initiatives may be enriched by incorporating the values of the ERV Methodology. In order to achieve such a shift in e-agriculture, I propose the following considerations:

- If e-agriculture places less emphasis on increasing agricultural productivity or participating in monetized markets and more on strengthening the social networks of small-scale farmers, it may enhance different forms of collaboration and ultimately help them to weave social *safety nets* on which to fall back when challenges arise.

- If the top-down, expert-based contents delivered by most e-agriculture platforms were be combined with those generated by farmers, fairer models of agricultural learning might be achieved. Particularly, if farmers can share and exchange locally held information and knowledge, more equitable forms of *cross-community* interaction could be propitiated.

- When e-agriculture strategies encourage the contextualized transformation of the modes of usage of technologies, such as mobile phones, the values embedded in those technologies might be shifted: from individualizing effects on *voice* towards more reciprocal ones. By encouraging a shared access to those technologies, for example, or by distributing their correlative costs, e-agriculture initiatives might reinforce reciprocal practices which, as discussed, can result in an increased sustainability and resilience of small-scale farming communities.

Complementarily, programs in agroecology that seek to strengthen reciprocal values or political agency in small-scale farming communities (such as *De Campesino a Campesino*, or the more explicitly political *Diálogo de Saberes*, discussed in chapters 3 and 4) might be enhanced and amplified through the transformative usage of mobile phones and the Internet, as provided in the ERV Methodology.

Such contributions to the fields of agroecology and e-agriculture would

probably increase their capacity to effectively respond to the widely issued call to end "business as usual" in agriculture[262] in order to recognize its multifunctionality, in which social, political, economic, and ecological factors are included along with scientific and technical ones. The demand to acknowledge the multifunctionality of agriculture responds, in turn, to the need to solve the large-scale, complex problems to which the model of technologically intensive industrial agriculture has contributed, such as anthropogenic climate change.

Enhancing farmer participatory research.

Both inside and outside the context of small-scale rural farming, there is already a considerable volume of theoretical and practical participatory methodologies regarding adaptation to climate change. These include participatory risk assessment (Aalst et al., 2008; Few et al., 2007), participatory scenario development (Bizikova et al., 2009) and multidisciplinary, *cross-community* development of adaptation strategies (Howden et al., 2007). However, none of these methodologies make an explicit usage of information and communications technologies to activate the mutual sharing of knowledge and information. Therefore, I suggest that the ERV Methodology may offer a valuable contribution to the disciplines engaged in farmer participatory research on adaptation to climate change: one that values and integrates different forms of locally held knowledge into its design, objectives, and practices. Thus, I claim that the reciprocal participation potentially enabled by the ERV Methodology could enhance farmer participatory research by fostering the dynamic interaction between different communities and systems of knowledge, and by providing scientific researchers with actual on-the ground information.

Contributions to socially engaged art.

Building upon the Megafone project.

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262 Dr. Robert Watson, director of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) declared that "business as usual is not an option," referring to the report's call for a radical transformation of the world's food and agricultural system. Dr. Watson claimed that "if a large part of the world isn't to go hungry in the 21st Century, the focus must be on a more rational, ecologically based use of scarce land and water resources, an equitable trade regime, and widespread recognition and action on climate change" (Watson, 2008).

As discussed in the introduction of this dissertation, *Sauti ya wakulima* and *Los ojos de la milpa* evolved from my collaboration in the socially engaged artistic interventions of the Megafone project. While the informal practices of this project exercised a strong influence on my own interventions, I attempted to use them as the basis for the formalization of the ERV Methodology, while refining and improving some of their aspects:

- The potential of the Megafone project for encouraging reciprocal behaviors was emphasized by explicitly reshaping mobile phones as communal tools for documentation.

- The limitations of the proprietary model followed by the Megafone project were overcome by publishing the ERV Methodology, and its related software platform, in an open-source fashion. Thanks to their open publication, other artists or researchers may appropriate, transform, and apply the tools and methodology in their own projects.

- The potential for *cross-community research* and interaction, not fully realized in Megafone, was affirmed in the ERV Methodology.

Reciprocal voice as a *critical exchange* in art.

Artists have the freedom to translate and recontextualize methodologies across disciplinary boundaries; therefore, the theoretical, methodological, and practical aspects of this dissertation may contribute to further artistic research and intervention.

As a socially engaged artist, I have attempted to *think art, act politics* throughout my practice and, consequently, I have provided frameworks that enable local processes of reciprocal exchange. Particularly in the context of *Sauti ya wakulima*, *voice* was reciprocally exchanged to express values, views, and opinions, and also as a form of social solidarity between small-scale farmers. Indeed, my work

resonates with Franco Berardi's call to artists to reconstruct the conditions for social solidarity (Berardi, 2012). Berardi claimed that those conditions could be reconstructed through the mindful perception of the other (Berardi, 2011, 2012). Such constructive perception may give rise to the need to enunciate and enact common ethical values that can transform the coexistence with the other into a feasible project. Consequently, I propose that constructive perception may also consist in the act of listening respectfully to the other's *voice*. And, when such an act is guided by reciprocity, listening may lead to action: to the active loop of replying, listening, and replying again.

In the socially engaged artistic interventions described in this dissertation, I have aimed to act as a critical outsider who, despite maintaining a certain distance from the communities where the interventions were carried out, sought to reinforce local social processes and values that might lead them to a greater resilience. I claim that these interventions may be considered as artistic because, rather than providing accurate data or information, they sought to explore complex questions related to values. These questions are therefore different from those generally asked by the scientific or policymaker communities. Moreover, the interventions attempted to go beyond mere usefulness. Rather than exclusively aiming at offering a service or a technical solution to a community, they were proposed as forms of *critical exchange*.[263] *Critical exchanges* in art emphasize the *transfers* that occur within the process of a work by valuing the *voices* of those who participate in it and, therefore, have the potential to induce social shifts (Purves, Selzer, 2014).

Within the sphere of *critical exchanges*, artistic practices may take shape by enhancing the reciprocal, *cross-community* interactions that are closely related to the production and socialization of knowledge. These dialogic practices often deal with education as an artistic form, also known as the *pedagogical turn* in the arts, which constitutes a relatively new medium (Podesva, 2007).[264] Artists who use education as a medium seek to engage participants in different processes of dialogue

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263 For a detailed discussion of *critical exchanges* in art, see Purves, Selzer, 2014.

264 A well-known, early example of education as artistic form may be found in the practice of Jospeh Beuys. After the 1970s, Beuys presented educational lectures as performances, with the intention of prompting further discussions carried out by the audience. The artist encompassed these and other similar practices with the notion of *Social Sculpture*, which articulated his belief that every human being had the creative capacity to creatively shape society (Beuys, 2006).

that may or may not result in the production of knowledge. These practices are strongly site-specific, since they generally seek to delineate a specific location and use discourse, debate, or exchange to transform it into a space for knowledge (Podesva, 2007; Kwon, 1997). As expressed through the insights of the the participants of *Sauti ya wakulima*, the sociotechnical setting provided through artistic intervention can be considered as an appropriable, context-sensitive framework for the production and exchange of a knowledge *commons*. Therefore, I claim that this research may contribute to the expanded field of education as art by proposing a theoretical and methodological framework for *reciprocal voice* as a means for peer-to-peer, de-institutionalized production of knowledge.

Critical exchanges in art often expect artists to approach a community with the purposes of engaging in a dialogic practice with its members and, ultimately, instantiating that process *as* artwork (Schneider, 2015). However, such a final outcome may be problematic from an ethical perspective, since the participants in those dialogues generally have unequal access to power, education, and cultural capital. Thus, rather than starting from a position of presumed equality between the artist and the members of the community, the artist might choose to assume the ethical position of *speaking nearby*, as proposed by the filmmaker Trinh T. Minh-ha (Chen, 1992). However, in contrast with these views, the artistic interventions discussed in this research are not intended to be presented as instantiations of dialogic processes, nor as the works of an artist who merely observed a community from nearby. Instead, these interventions are socially engaged methodological enablers of autonomous exchanges within specific communities. Moreover, in their attempt to encourage environments where *reciprocal voice* could be autonomously exchanged, the role of the artist becomes progressively unimportant over time. As already suggested in the introduction of this dissertation, the artist who chooses to take up this role may be described as a critical outsider: as an instigator of dialogues and cultural shifts that remains distant, precisely for the sake of the autonomy of the social processes he or she wishes to induce. Such is the position I have tried to assume in the case studies presented here.

The transformation of technologies as an ethical endeavor in

socially engaged art.

This research may contribute to the consolidation of socially engaged art as a field from which technologies may be critically transformed according to ethical values. I have acknowledged that attempting to strengthen *reciprocal voice* through the usage of information and communications technologies represents a paradox, by pointing out that these are the very technologies that significantly contribute to the intensification of the crisis of *voice* (described in chapter 1). However, I have also emphasized that their usage must be a transformative one in order to effect such strengthening. I claim that by transforming technologies, as exemplified in this research, socially engaged artistic interventions can reinscribe the hegemonic values embedded in technologies with alternative ones. This form of intervention may support an understanding of technological transformation as an element that interweaves ethics with socially engaged artistic practice. This fusion may also be regarded as an act with political repercussions. The interaction of these elements became apparent in the opinions of Mrs. Renalda Msaki about *Sauti ya wakulima*. When she expressed that the project "had brought cohesion to the group," and that she had learned that "computers were not just fancy things for rich people in towns," but also tools that could help farmers solve their problems, she revealed that symbolic and political transformations were being experienced by her group. The available smartphones became symbols of reciprocity, and their exchange may have helped to construct or strengthen reciprocal ties within the group of participants, thereby bringing cohesion. Moreover, the words of Mrs. Msaki could be interpreted not only as an implicit recognition of the political importance of reshaping the technologies that have pervaded daily lives, but also as a transformed perception of the relation between herself and the others (the rich), and of technological artifacts as well. In this example, the exchange of phones is a symbol of reciprocity interwoven with a renewed perception that can mitigate social divisions or create a sense of empowered ownership with respect to everyday technology.

Therefore, the critical transformation of technologies, undertaken as a counter-hegemonic endeavor, may become an additional constitutive element of socially engaged art. This critical transformation of socially relevant technologies is a

new element that can be explicitly integrated into the practice of socially engaged art by addressing the political relevance of rewriting the values embedded in everyday information and communications technologies, in order to induce ethical shifts, such as the strengthening of *reciprocal voice*.

I propose that the integration of ethical and political elements into artistic interventions, especially those that seek to transform technologies for the amplification and dissemination of *voice*, can restore meaning to those spheres of human activity that are increasingly mediated and constrained by the values, capacities, and limitations of technologies. Philosopher Marshall McLuhan argued that if an unmitigated acceptance of technological development continued, humans would become the "sex organs of the machine world, as the bee of the plant world, enabling it to fecundate and to evolve ever new forms" (McLuhan, 1994, p.46). However, it might be argued that, thanks to the process of internalization of extreme forms of economic competition that have spread across societies, humans themselves may be increasingly (even if unwittingly) shaping their values and behaviors according to those embedded in digital technologies. Thus, through this process, instead of merely aiding the reproduction of the *machine-world*, to use McLuhan's term, humans would progressively become its constitutive components. The dangers that this change might bring to different areas of human life, particularly those related to culture, suggest that activating counter-hegemonic artistic practices of technological transformation based on ethical values may become a relevant and rather urgent endeavor.

However, sociologist Ulrich Beck suggested that ethics were largely powerless against the relentless advance of technology. Instead, he posited that *organized irresponsibility* prevailed, because modern societies allowed technocrats a practically unrestricted freedom to introduce technologies, and they lacked the means to hold anyone accountable for the negative effects[265] of those technologies (Beck, 1992). I consider that the artistic interventions reflected in this dissertation can challenge such a point of view. It is true that laws and treaties, at national and international

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265 Beck understood the negative effects of modern technologies through the broader term *risk society*, which he coined together with sociologist Anthony Giddens. Beck argued that modern societies are exposed to manufactured risks, such as pollution, that are the result of the very process of modernization (Beck, 1992).

levels, have largely failed to limit and regulate technological development and economic growth, or to mitigate their combined negative effects.[266] Furthermore, several authors have documented such failures while pointing out that, under neoliberalism, democratic organizations and political agreements based on consensus have become essentially ineffective (Chomsky, 2010; Klein, 2007; Ziegler, 2002).

In this dissertation I have argued in favor of bottom-up shifts on a much smaller scale, aiming to arrive at a fresh set of ethical and moral standards that enable *voice* and may reshape social conduct by steering it away from the hegemonic narrative of competition towards alternative, perhaps more respectful and reciprocal forms of exchange. And, although the interventions discussed in this dissertation took place at extremely reduced scales, I suggest that many small transformations may gradually bring about larger, more durable ones.[267] They may do so on the condition that they result from biopolitical agency, which is both a form of resistance as well as a production of alternative subjectivities that, in turn, generate a *commons*. Small-scale resistance might convey durability to biopolitical agency, because it is generally propelled by the intrinsic motivations of those who exercise it. Moreover, the fact that a *commons* may be produced through resistance endows biopolitical transformation with the potential of expanding by reciprocally sharing the *commons* with others. Thus, I claim that socially engaged art might be considered as a field of thought and practice that is particularly well suited for imagining and enacting small-scale biopolitical transformations like the ones discussed in this dissertation.

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266 On an international level, a notable example of failure may be found in the Kyoto Protocol. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which legally binds its signatories to reduce their collective emissions of greenhouse gases. Although the agreement was signed by 83 countries and ratified by at least 55, it largely failed to effectively reduce the emissions of industrialized countries. The emissions of the European Union, for example, actually showed important increases after the protocol was signed and ratified (Prins, Rayner, 2007; other sources: http://unfccc.int/kyoto_protocol/items/2830.php, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php, both retrieved 13.05.2015).
On a national level, the example of Ecuador stands out among many. In 2008, a new constitution that incorporated the rights of nature was adopted in that country. The articles in its seventh chapter stated that nature, or Pachamama, the earth mother revered by the indigenous people of the Andes, had the right to be respected, restored, and protected, and that the State will restrict activities that may lead to the extinction of species or the destruction of ecosystems (Source: http://educacion.gob.ec/wp-content/uploads/downloads/2012/08/Constitucion.pdf, retrieved 13.05.2015). However, in 2013, Ecuadorian president Rafael Correa undermined the spirit of the constitution by giving the green light to oil drilling in the Yasuní national park, a UNESCO biosphere reserve located in the Amazon rain forest (Source: http://www.theguardian.com/environment/2014/may/23/ecuador-amazon-yasuni-national-park-oil-drill, retrieved 13.05.2015).

267 This suggestion agrees, again, with the pursuits of organized networks, by seeking to go beyond normative frameworks in order to conceive "forms of gathering, coalition, and association in relation to a more wild and formless social being" (Lovink, 2014, p.107).

Moreover, socially engaged art might also be regarded as a political bridge between ethics and technology from which technological and economic rationalities can be critiqued.

6.5 Recommendations for other researchers.

During the course of this study, other teams of researchers have used the tools and methodologies that I have developed. Starting in 2013, the Berlin-based r0g Agency for Open Culture and Critical Transformation applied the ERV Methodology and the *ojoVoz* software platform to carry out a project aimed at the management of common agricultural resources in South Sudan[268]. In 2015, the Colombian platform ComunLAB also took up the tools and methodologies developed in this research to help a community manage and protect the ecosystems of the Pance river, near the city of Cali[269].

Consequently, I conclude this dissertation with a set of recommendations for researchers in the future:

- Regard *voice* as an element of biopolitical agency, where biopolitics is understood as the embodied, communal resistance and production of alternative subjectivities in the form of a commons.

- Reflect on the fact that the commons, and in particular knowledge commons, is not produced by solitary individuals, but through a vast network of cooperative, reciprocal work.

- Consider the fact that rationality is a pervasive mode of thinking embedded into *voice* and agency, and that *reciprocal rationality* has the potential to permeate our everyday behavior, prompting us to think, speak and act in more reciprocal ways.

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268 The r0g agency for open culture and critical transformation focuses on creating sustainable open systems solutions for post-conflict development. Their website can be accessed at http://openculture.agency/about_us/ (retrieved 13.09.2015). The project in South Sudan that features the ERV Methodology and the *ojoVoz* software platform can be accessed at http://sautiyawakulima.net/southsudan (retrieved 13.09.2015)

269 ComunLAB is a platform for artistic, technological and cultural experimentation, dialogue and creativity in Cali, Colombia. Their website can be accessed at http://comunlab.cc/ (retrieved 13.09.2015). The project with communities living near the Pance river is available at http://sautiyawakulima.net/proyectopance (retrieved 13.09.2015).

- Consider that the sharing of knowledge commons through the exchange of *reciprocal voice* can be a source of resilience for different communities at risk of social exclusion.

- Understand technologies as tools that serve a concrete and necessary purpose, so that they may be more readily contextualized and transformed. In the specific case of information and communications technologies, such transformation can lead to the reinscription of their embedded values, that by default yield a uniform mode of mass-self communication, into more reciprocal ones.

In conclusion, the ERV Methodology can become a strategy for inducing the reciprocal exchange of *voice* through responsivity, rather than imposing it through coercion. This methodology puts forward an adaptable sociotechnical setting that can be fruitfully applied in the context of socially engaged artistic intervention and *cross-community research*. When carefully contextualized and applied in small-scale farming communities, the ERV Methodology may be regarded as a significant strategy to help those communities resist against the progressive dismantling of their reciprocal and resilient practices and forms of exchange.

7. Glossary of relevant terms.

AGRA: the Alliance for a Green Revolution In Africa is currently being implemented in several African countries, including Tanzania, through a partnership between large US corporations and private and public organizations. It stands by the same values of its predecessor, the Green Revolution, yet it is largely driven by recent developments in biotechnology.

agroecology: agroecology is a field of knowledge that uses ecological theory to study, design, manage, and evaluate agricultural systems that are productive but also respectful of the environment. Agroecology considers the interactions between biological, physical, technical, social, and economic factors that are relevant to farming systems. Because of its practical implications and holistic scope, agroecology has been described not only as a scientific discipline, but also as a social, cultural, and political movement (Altieri, 1989; Gliessman, 2000; Toledo, 2011).

Android: a smartphone operating system developed by Google.

app: a software application designed to run on smartphones.

biopolitics: as understood by Hardt and Negri, biopolitics is primarily the basis of a political project that deals with the struggles for an autonomous production of subjectivity in the face of totalitarian regimes (Hardt, Negri, 2009).

coercion: a form of punishment that tends to stabilize cooperation and reciprocal exchanges, on the condition that the punishment is regarded as a common good, that is, that the punished person pays a price and everybody benefits from it (Tomasello, 2010).

coevolution: this notion originated in the context of biological sciences (Janzen, 1979) and is used in this dissertation to describe how agriculture and sociotechnical systems reciprocally affect each other's evolution.

commons: a general term for shared resources in which each stakeholder has an equal interest (Ostrom, 1990). The commons poses an alternative to the notions of *private* and *public*, since it is not produced by solitary individuals or by the state, but through a vast network of cooperative work.

community: a group of people whose cohesion and boundaries are constructed through symbolic interaction.

comunalidad: an internal normative system based on reciprocal, cooperative labor that serves as a guideline for the political organization of the Mixe people of Oaxaca. The reciprocal basis of *comunalidad* extends to a general consideration of all living beings as equal subjects. It is precisely this interdependence of all beings that drives the need for mutual care and conservation (Díaz, 2007).

critical exchange: critical exchanges in art emphasize the transfers that occur within the process of a work by valuing the voices of those who participate in it and, therefore, have the potential to induce social shifts (Purves, Selzer, 2014). Critical exchanges often expect artists to approach a community with the purposes of engaging in a dialogic practice with its members and, ultimately, instantiating that process as artwork (Schneider, 2015).

cross-community research: an integrative research strategy that breaks with the commonly held assumption that isolated disciplines may solve complex, multifaceted problems, and that emphasizes research enacted jointly and equally by members of different communities, including those whose systems of knowledge might not necessarily be considered as academic disciplines.

cyberlibertarianism: a deterministic vision that portrayed the Internet as a neutral technological system that could serve humanity to achieve its higher ends. Cyberlibertarianism identified with the radical individualism of right-wing libertarianism and, according to Winner, contributed to obfuscate the social

transformations that the new digital networks brought about, and showed little concern about issues such as injustice or inequality (Winner, 1997).

De Campesino a Campesino (Spanish: From Farmer to Farmer): an agroecological program that has successfully engaged small-scale farmers in the reciprocal transmission and collective construction of knowledge, practices, and methods by allowing them to "unleash their creativity in solving their own problems" and turning isolated "sustainable" techniques into complex agroecological systems (Holt-Giménez, 2006; Machín et al., 2013, p.23).

Diálogo de Saberes: Diálogo de Saberes may be translated as dialog among different knowledges and ways of knowing (Martínez-Torres, Rosset, 2014). It is a central constituent of the internal organization of Vía Campesina, and consists of a a "collective construction of emergent meanings based on dialog between people with different historically specific experiences, cosmovisions, and ways of knowing, particularly when faced with new collective challenges in a changing world" (Martínez-Torres, Rosset, 2014, p. 982).

e-agriculture: e-agriculture is an emergent field of practice that seeks to apply information and communications technologies to enhance the productivity and efficiency of small-scale farmers. In the available literature, e-agriculture is also referred to as mAgriculture (mobile agriculture) or, more recently, ICT4AG (information and communications technologies for agriculture).

economic rationality: as stated by Becker, economic rationality is a form of human behavior that assumes that all humans seek optimization and maximization; that every action is performed in some kind of market; and that the preference of maximizing benefits and minimizing costs is a constant throughout different societies and circumstances (Becker, 1976).

ERV Methodology: the ERV (Enabling Reciprocal Voice) Methodology was developed and applied within the contexts of artistic intervention and cross-community research in rural settings. It consists of an open-ended set of guidelines

whose main purposes are: 1) helping a group to establish a shared communicational praxis through which the voices of its members can be heard, 2) enable the collaborative production of a knowledge commons, and 3) strengthening reciprocal relations within the group and, potentially, with other members of its social context. In order to achieve its purposes, the ERV Methodology uses a set of technological components, as well as social and organizational ones.

food security: according to the Food and Agriculture Organization (FAO), food security "exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

food sovereignty: a grassroots notion introduced by Vía Campesina, defined as "the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems. It develops a model of small scale sustainable production benefiting communities and their environment. It puts the aspirations, needs, and livelihoods of those who produce, distribute, and consume food at the heart of food systems and policies rather than the demands of markets and corporations" (Source: http://viacampesina.org/en/index.php/organisation-mainmenu-44, retrieved 28.03.2014).

Green Revolution: a strategy led by the United States since the 1940s, aimed at bringing high-input, high-yield agriculture to developing countries. In this dissertation, I examine the outcomes of the Green Revolution in Mexico, which took place between the 1940s and the 1980s.

GM maize: Genetically Modified maize, which has two new properties achieved through biotechnological methods: resistance against herbicides and production of endotoxins that kill specific pests (Meyer, 2011).

hybridity: in this dissertation, hybridity refers primarily to the quality of certain local economies in the developing world in which monetization coexists with

other forms of exchange, such as gifts.

IAASTD: the IAASTD (International Assessment of Agricultural Knowledge, Science, and Technology for Development) was an international effort sponsored by the World Bank and the Food and Agriculture Organization FAO, among others, that aimed at assessing the relevance and quality of agricultural knowledge, science, and technology, and its impact on global policies.

knowledge commons: a commons constituted by knowledge about a specific matter. A knowledge commons is produced collaboratively, it is shared mutually, and it is not subject to depletion through usage.

Los ojos de la milpa (Spanish: The eyes of the milpa): the second case study of this research, in which two groups of farmers in Santa María Tlahuitoltepec, Mexico, used smartphones and the Internet to produce a community manual about their agricultural practices. *Los ojos de la milpa* can be accessed at http://ojosdelamilpa.net (retrieved 17.02.2016).

Megafone: the Megafone project consisted of a set of socially engaged artistic interventions and was initiated and directed by Catalan artist Antoni Abad. The project sought to amplify the voices of different communities at risk of exclusion by gathering groups of people from those communities and providing them with mobile phones and a web page to be used jointly as a platform for the public expression of their views and opinions. The Megafine project can be accessed at http://megafone.net (retrieved 17.02.2016).

MIAF: acronym of Milpa Intercalada con Árboles Frutales (Spanish: Milpa Intercropped with Fruit Trees) is an agroforestry initiative developed by agronomists of the Colegio de Postgraduados (Spanish: Postgraduate College) in Texcoco, Mexico. The aims of this initiative are: 1) preventing soil erosion caused by rainfall, by intercropping fruit trees with maize and bean plants, 2) protecting plant biodiversity, 3) increasing carbon sequestration, and 4) providing additional sources of income for farmers. The MIAF initiative was in process of implementation in the community

where I carried out the second case study of this research.

milpa: a Mesoamerican agricultural practice in which different plants (namely maize, beans and squash) reciprocally interact with each other by performing a mutually supportive ecological role.

NAFTA: the North American Free Trade Agreement, signed in 1994 by the US, Canada and Mexico, which prompted the full implementation of the neoliberal model in the participating countries and established a deregulated market based on the elimination of trade barriers and tariffs.

Nane Nane show: the Nane Nane show is an agricultural fair held annually in Morogoro, Tanzania, and is considered to be a national celebration in Tanzania. The show provides farmers with the opportunity to showcase their crops and products, socialize, and do business. The show also became a major opportunity for the participants of *Sauti ya wakulima* to gather and share information and knowledge about agricultural practices.

neoliberalism: the currently existing form of capitalism, which has become globalized and hegemonic, whose core principles include economic deregulation and privatization. According to Polanyi, by overriding all other forms of social organization, a free-market economy such as the one envisioned by neoliberalism threatens to tear apart human relations by privileging the self-centered interests of capitalists. (Polanyi, 1996).

ojoVoz: the software platform that constitutes the main technological component of the ERV Methodology. The ojoVoz platform consists of an app for Android smartphones and a web-based platform, and is publicly available under an open source license at http://ojovoz.net (retrieved 17.02.2016).

open source: a social movement created around the idea of defending free access to software code, often developed in a public, collaborative manner, and therefore considered as a knowledge commons. Open Source is also a model for the

licensing of digital content that clearly stands in opposition to the closed, proprietary software model offered by corporations.

organized network: organized networks consist of small-scale coalitions whose strong bonds emerge out of peer-to-peer encounters, and whose aim is to cooperate in order to realize projects and produce cultural artifacts (Lovink, 2011).

reciprocal rationality: in contrast with economic and technological rationalities, which compel people to think, speak, and act in terms of economic benefit and technological automatisms, a reciprocal rationality might become an encouragement to do so in terms of giving, receiving, and returning in a mindful and respectful way.

reciprocal voice: following Mauss's studies on the reciprocal exchange of gifts and non-monetized forms of exchange, reciprocal voice is the consideration of voice as a gift. If a gift economy is rests on the obligations of giving, receiving, and giving back, reciprocal voice entails, correspondingly, the obligations of speaking, listening, and replying. This notion is a theoretical tool that seeks to contribute to the restoration of the political value of voice.

reciprocity: a moral principle that describes an equal, two-way relationship by stating that one should treat others as one would like others to treat oneself. As an economic principle, reciprocity is bound by three obligations: giving, receiving, and returning gifts (Mauss, 1971).

resilience: resilience may be defined as the capacity of socioecological systems to "adapt and change in response to critical signals, or have inbuilt redundancy to withstand shocks" due to biotic factors, such as climate, or abiotic ones, such as markets (Almås, Campbell, 2012, p.7).

responsivity: the affective perception of social interaction by which social norms might emerge (Jullien, 2010b). Responsivity was followed as a strategy in this research as an attempt to find an alternative to coercion in the process of

strengthening reciprocal behaviors.

Sauti ya wakulima (Swahili: The voice of the farmers): the first case study of this research, in which a group of farmers in Bagamoyo, Tanzania, use smartphones and the Internet to produce a knowledge commons about their environment and agricultural practices. *Sauti ya wakulima* can be accessed at http://sautiyawakulima.net (retrieved 17.02.2016).

small-scale farmer: farmers who carry out their activities in less than 2 hectares of land, whose production is largely destined to subsistence, and who significantly depend on traditional or locally held knowledge.

smartphone: a mobile phone that integrates features commonly found in personal computers. Besides accessing mobile networks, smartphones can also access the Internet. Most of them have a touchscreen user interface, are capable of running apps, and include cameras and sound recorders.

social exclusion: a complex process in which various forms of exclusion may be combined: participation in decision making and political process, access to employment and material resources, and integration into common cultural process (Byrne, 2005; Madanipour et al., 1998).

socially engaged art: an expanded field of post-studio practices in which art becomes "a form of experimental activity overlapping with the world" (Bishop, 2012, p.44). Socially engaged art is generally aimed at the creation of platforms or networks that facilitate the participation of others

sociotechnical: the quality of a methodology or a technological system that uses a systemic approach to describe and understand the complex interaction between people and technology (Winner, 1988; Long, 2013).

solutionism: a prevailing ideology which maintains that computer applications may solve any complex social, political, or environmental problem in

such an efficient and smooth way that they make all other possible solutions seem primitive and inferior (Morozov, 2013).

strong reciprocity: a propensity to cooperate with others similarly disposed, even at a personal cost, and a willingness to punish those who violate cooperative norms (Gintis et al., 2008).

tactical media: a term used to describe art practices that critique and oppose the hegemonic political and economic orders by using the same technologies (namely digital networking technologies) that make them possible (Garcia, Lovink, 1997; Kluitenberg, 2011).

tag: a keyword that is added to audiovisual content in order to describe it. A tag associated to content becomes part of its metadata. A bottom-up, common vocabulary created by content generators may emerge from a set of contents enriched with tags. Using tags may become a form of sense-making, as well as a highly subjective and collaborative form of classification (Tisselli, 2010a).

technological determinism: a reductionist vision based on the assumption that the higher ends of civilization may be reached through a neutral and autonomous technological development.

technological rationality: according to Marcuse, technological rationality is a form of thought and behavior propitiated by the excessive technification of human life. Technological rationality tends to promote a false consciousness immune to dialectical questioning, while it wipes out the individual by reducing it to a series of automated functions that treated people as the appendages of machines (Marcuse, 2004).

technology: a term formally introduced by Veblen to describe how machines, by the end of the 19th century, had become a cultural force of wide-reaching consequences, due to the fact that their operation had ostensibly displaced anthropomorphic habits of thought and practice and compelled workers to adapt to

their design and modes of usage (Veblen, 2013).

Traditional Ecological Knowledge: an approach in agroecology defined as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1999, p. 8).

transformation/malleability of technology: the transformation and malleability of technology is understood in this research as the possibility of transforming a specific technology in order to rewrite its purposes, functions, and values.

Vía Campesina: a grassroots movement that emerged during the 1980s and early 1990s from the coalition of autonomous rural farmer organizations, first in Latin America and then on a global scale (Martínez-Torres, Rosset, 2010). Since 1996, the notion of *food sovereignty* became the movement's flagship.

voice: a human capacity that renders the symbolic construction of a community physically possible. It is also considered in this research as an instrument for political recognition.

weak reciprocity: a reciprocal exchange that must be profitable for both parts (Guala, 2012).

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9. List of Appendix Materials:

- **Appendix A:** SOFTWARE

  - PDF of the *ojoVoz* software platform

  - Video tutorial of the *ojoVoz* software platform

- **Appendix B:** E-AGRICULTURE

  - Notable e-agriculture initiatives in Africa, Asia and Latin America

- **Appendix C:** CASE STUDY DOCUMENTATION

  - Ethical standards certification letters.

  - First presentation of the case study in Tanzania.

  - Visual user's manual of the ojoVoz mobile app.

  - Project report delivered to the Bagamoyo district director.

  - Letter of engagement delivered to the Bagamoyo district director.

  - Visual calendar of the MIAF system (prepared by Mr. Odilón Martínez)

  - Sample presentation of case studies (used for dissemination purposes)

- **Appendix D:** CASE STUDIES: MESSAGE EXAMPLES

  - Photos and transcriptions from messages sent by participants.

- **Appendix E:** ADDITIONAL CONTEXTUAL BACKGROUND

  - The origins of agriculture and its *coevolution* with sociotechnical systems

- **Appendix F:** VIDEO DOCUMENTS[270]

  - Documentary clip of *Sauti ya wakulima* (Duration: 3:10; French with English subtitles)

  - Documentary video of *Sauti ya wakulima* (Duration: 17:56; German with English subtitles)

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270 The videos included in Appendix F were commissioned and produced by the Swiss NGO Brot für alle (Bread for all).