

## Non-governmental organizations, strategic bridge building, and the “scientization” of organic agriculture in Kenya

Jessica R. Goldberger

*Department of Community and Rural Sociology, Washington State University, Pullman, Washington, USA*

Accepted in revised form July 7, 2007

**Abstract.** This paper contributes to the growing social science scholarship on organic agriculture in the global South. A “boundary” framework is used to understand how negotiation among socially and geographically disparate social worlds (e.g., non-governmental organizations (NGOs), foreign donors, agricultural researchers, and small-scale farmers) has resulted in the diffusion of non-certified organic agriculture in Kenya. National and local NGOs dedicated to organic agriculture promotion, training, research, and outreach are conceptualized as “boundary organizations.” Situated at the intersection of multiple social worlds, these NGOs engage in “strategic bridge building” and “strategic boundary-work.” Strategic bridge building involves the creation and use of “boundary objects” and “hybrid forms” that serve as meeting grounds for otherwise disconnected social worlds. Strategic boundary-work involves efforts to “scientize,” and thereby legitimize, organic agriculture in the eyes of foreign donors, potential research collaborators, the Kenyan state, and farmers. Examples of strategic bridge building and boundary-work are presented in the paper. The Kenyan case illustrates that different social actors can unite around a shared objective – namely, the promotion and legitimization of organic agriculture as an alternative to the Green Revolution (GR) technological package.

**Key words:** Boundary object, Boundary organization, Boundary-work, Green Revolution, Kenya, Non-governmental organization, Organic agriculture, Science

**Abbreviations:** ABLH – Association for Better Land Husbandry; FORMAT – Forum for Organic Resource Management and Agricultural Technologies; GR – Green Revolution; IFOAM – International Federation of Organic Agriculture Movements; KIOF – Kenya Institute of Organic Farming; MHAC – Manor House Agricultural Centre; NGO – Non-governmental Organization; SACDEP – Sustainable Agriculture Community Development Program; SACRED – Sustainable Agriculture Centre for Research and Development in Africa

*Jessica R. Goldberger received her PhD in sociology from the University of Wisconsin–Madison and is currently an assistant professor in the Department of Community and Rural Sociology at Washington State University. Her research agenda centers on agricultural knowledge, science, and technology in the United States and global South. She has published on Bt corn farmer compliance with insect resistance management requirements (AgBioForum), gender and agricultural science (Rural Sociology), and sustainable agriculture research at land-grant universities (Journal of Sustainable Agriculture).*

### Introduction

Academic interest in organic agriculture has grown in the last decade as the number of certified and non-certified organic farms has increased worldwide. Social scientists have employed several theoretical frameworks to analyze the spread of organic agriculture: reflexive modernization (Kaltoft, 2001), adoption–diffusion (Padel, 2001), commodity networks (Raynolds, 2004), social movements (Tovey, 1997), and globalization (Nigh, 1997). The purpose of this paper is to show that the sociology of science

literature on boundaries also provides a compelling framework for making sense of the relational processes at work with respect to the diffusion of organic agricultural practices in the global South. Specifically, I examine how negotiation, communication, and coordination across multiple social worlds, knowledge domains, and geographic scales have resulted in the spread of non-certified (informal or de facto) organic agriculture among Kenyan farmers. I offer one of the first in-depth applications of the boundary framework – which includes concepts such as “boundary-work” (Gieryn, 1983, 1995, 1999), “boundary

organization” (Moore, 1996; Guston, 1999, 2000; Cash, 2001), and “boundary object” (Star and Griesemer, 1989; Star, 1989) – to organic agriculture (although see Gieryn, 1999).

In this paper, I argue that national and local non-governmental organizations (NGOs) dedicated to organic agriculture promotion, training, research, and outreach continually negotiate the boundaries between multiple social worlds (e.g., foreign donors, farmers, agricultural researchers, and the Kenyan state), knowledge domains (e.g., formal agricultural science and local knowledge), and geographic scales. As boundary organizations, organic agriculture NGOs engage in “strategic bridge building” by creating and using boundary objects and hybrid forms to unite multiple social actors around common objectives, such as promoting a sustainable agricultural alternative to the Green Revolution (GR) regime. They also engage in “strategic boundary-work” by expanding the boundaries of formal agricultural science to include indigenous farming knowledge/practice that had been previously decried by GR pioneers as “traditional” and thus not scientific. Because of its “scientization” by NGOs, organic agriculture in Kenya has achieved a degree of legitimacy and authority in the eyes of donors, agroscientific institutions, the Kenyan state, and small-scale farmers.

This paper is organized into seven sections. First, I review the boundary-related research within the sociology of science. Second, I discuss the increasing popularity of the practice and study of organic agriculture in the global South. Third, I discuss the growth of NGOs in agricultural development. Fourth, I explain how discontent with the GR regime created space for new institutional actors (i.e., NGOs) and alternative agriculture approaches in Kenya. Fifth, I argue that organic agriculture NGOs in Kenya can be considered boundary organizations. In the final two sections, I present several examples of how these NGOs engage in “strategic bridge building” and “strategic boundary-work.”

### Theoretical and conceptual framework

Originating with classic works by Emile Durkheim (*Elementary Forms of Religious Life*), Karl Marx (*The Eighteenth Brumaire*), and Max Weber (*Economy and Society*), the study of “boundaries” has spanned a wide range of substantive areas: social and collective identity; class, race, and gender inequality; professions and work; science and knowledge; national identity and nation building; and spatial boundaries (Lamont and Molnár, 2002). The ubiquitousness of boundary concepts – e.g., boundary-work, boundary crossing, boundary shifting, boundary spanning, boundary organizations, and boundary objects – within the social sciences is not

surprising given that the notion of boundaries “captures a fundamental social process, that of relationality...across a wide range of social phenomena, institutions, and locations” (Lamont and Molnár, 2002: 169).

This paper draws on the boundary-related research within the sociology of science. Most of this research has focused on the boundary between “science” and “non-science.” Some scholars see the science/non-science boundary as a site of perpetual contestation and strategic negotiation between scientists and non-scientists. I include “boundary-work” theorists in this group of scholars (e.g., Gieryn, 1983, 1995, 1999; Fisher, 1990; Gaziano, 1996; Kinchy and Kleinman, 2003; Mellor, 2003). In contrast, other social scientists conceptualize boundaries as interfaces that facilitate communication, knowledge production, and information circulation across multiple social worlds. This strain of boundary-related research includes studies of “boundary organizations” (e.g., Moore, 1996; Guston, 1999, 2000, 2001; Cash, 2001) and “boundary objects” (e.g., Star and Griesemer, 1989; Bowker and Star, 1999). These studies, unlike boundary-work research, emphasize cooperation rather than competition, and inclusion rather than exclusion. I now review recent scholarship on boundary-work, boundary organizations, and boundary objects.

### *Boundary-work*

In a groundbreaking *American Sociological Review* article, Gieryn (1983) argues that the demarcation of science from non-science is not only an *analytical* problem for sociologists and philosophers, but also a *practical* problem for scientists. He introduces the notion of “boundary-work” to refer to the continual construction *by scientists* of boundaries between science and non-science in order to advance and protect their professional authority. In other words, scientists assign certain characteristics to the institution of science – its practitioners, methods, knowledge base, values, and work structure – in order to distinguish science from non-scientific intellectual and technical pursuits. Boundary-work “occurs as people contend for, legitimate, or challenge the cognitive authority of science – and the credibility, prestige, power, and material resources that attend such a privileged position” (Gieryn, 1995: 405). These demarcation activities amount to “credibility contests” whereby scientists seek to establish their “epistemic authority” to “define, describe, and explain bounded domains of reality” (Gieryn, 1999: 1).

Gieryn (1983, 1995, 1999) identifies four distinct types of boundary-work: monopolization, expulsion, protection of autonomy, and expansion. “Monopolization” refers to the delineation of authentic and authoritative knowledge and the denial of authority to outsider claims and practices. “Expulsion” occurs when scientists exclude deviants, pseudoscientists, fakes, and other

heterodox individuals or groups from the authoritative cultural space occupied by “real” science. “Protection of autonomy” refers to the ways in which scientists protect their material and symbolic resources from outside powers who seek to exploit scientists and science for their own aims. “Expansion” involves scientists extending their epistemic authority and expertise into domains (e.g., religion, politics, ethics, folk knowledge) claimed by other professions or occupations. As I explain below, most of the boundary-work performed by organic agriculture NGOs in Kenya is of the “expansion” variety. By “scientizing” organic agriculture, NGOs are effectively expanding the boundaries of formal agricultural science to include knowledge and practices previously considered “traditional” and “non-scientific.”

To flesh out the notion of boundary-work, Gieryn (1983, 1995, 1999) presents several case studies, including an analysis of the lifework of Sir Albert Howard (1873–1947), the founder of modern composting and an early proponent of organic farming. Gieryn (1999) argues that Howard, a botanist who worked in England, the West Indies, and India during the first half of the 20th century, engaged in decades of boundary-work to legitimize eastern agricultural wisdom in the eyes of western scientists. As Imperial Economic Botanist to the Government of India, Howard worked at the boundary of indigenous agricultural knowledge/practice (“traditional wisdom”) and the systematic discipline of botany (“modern science”) (Gieryn, 1999: 243). The result of this work was a “hybridized imperial economic botany” which did not favor “science or indigenous wisdom, plant or conditions, gene or environment, pure or applied, quantitative or qualitative, agriculture or botany, plant or practices, cultivator or miller, India or England,” but rather combined all of these myopic standpoints (Gieryn, 1999: 285).

Kloppenborg (1991) does not explicitly employ the term boundary-work, but offers insight into the construction, deconstruction, and reconstruction of the boundaries of US agricultural technoscience during the past century. He explains that farmers, agricultural laborers, and associated craftspeople were the primary developers of new agricultural practices and technologies through the early 1900s. However, agricultural scientists began to gradually construct boundaries around (and thereby protect the superiority of) their way of knowing by devaluing the knowledge generated by farmers and other non-scientists. The “academicization” of agriculture – through the establishment of the land-grant system of agricultural education, research, and cooperative extension – effectively transformed farmers from generators of local knowledge on the farm to recipients of agroscientific knowledge produced within the confines of formal agricultural institutions. Beginning in the 1960s, a wide variety of activists, agricultural practitioners, and

academics began to express their dissatisfaction with formal agricultural science – e.g., its tendency toward reductionism, its limited applicability to actual farming operations, its lack of holistic understanding of ecological systems, and its association with social and environmental externalities. Kloppenborg states that this critique or “deconstruction” of agricultural science creates space for alternative ways of knowing. He calls for natural and social scientists to engage in the “reconstruction” of agricultural science to bring farmers, agricultural workers, and others back into the agricultural knowledge and technology production process. Reconstruction can be construed as an entirely new era of boundary-work within formal agricultural science – an era of expanding (rather than narrowing) the boundaries of agroscientific discourse through the identification and legitimation of alternative voices and sources of knowledge.

### *Boundary organizations*

Moore (1996) argues that scientists not only engage in boundary-work, but also seek affinities between science and other interests. One way to accomplish the latter task is through the formation of organizations that bring together scientific and non-scientific (e.g., political) interests. Neither purely scientific nor purely political, these organizations “provide an object of social action and stable but flexible sets of rules for how to go about engaging with that object” (Moore, 1996: 1598). Building on Moore’s work, Guston proposes the concept of “boundary organizations” to describe entities that “internalize the contingent character of the science/politics boundary” (1999: 90–91; also see Guston, 2000, 2001). Guston (1999) presents three defining characteristics of boundary organizations: (1) they exist at the boundary between distinct worlds with responsibility and accountability to each side of the boundary; (2) they involve the participation of actors on either side of the boundary, as well as specialized mediators; and (3) they provide a space for the creation and use of mutually instrumental boundary objects (defined below). An organization’s success at performing these three tasks – dual accountability, mediation, and collaboration – leads to the enduring stability of the science/non-science (or science/politics) boundary (Guston, 1999, 2000).

Organizations involved in technology transfer are very good examples of boundary organizations. Borrowing from Latour’s (1987) vision of science, Guston (1999) attributes “Janus-like” qualities to technology-transfer organizations (such as the Office of Technology Transfer at the National Institutes of Health) because of their ability to appeal strategically to actors on either side of the science/non-science boundary. Cash (2001) focuses on the multilevel institutional framework associated with

the US Cooperative State Research, Education, and Extension Service (CSREES). He employs Guston's (1999) boundary organization framework to describe county agricultural extension offices. County extension offices (1) adhere to institutionalized rules that dictate responsibilities and accountability to farmers, extension specialists, and land-grant scientists; (2) mediate between farmers, extension specialists, and land-grant scientists; and (3) provide a space where boundary objects (e.g., cropping or economic models) serve as meeting grounds for actors on both sides of the science/non-science divide (Cash, 2001: 439–441). Cash extends the boundary organization concept to incorporate science/policy linkages across *multiple levels* of organization. CSREES, for example, was designed to allow for “sensitivity to diverse and geographically heterogeneous interests,” ranging from the interests of individual farmers to the interests of federal, state, and county governments (Cash, 2001: 441).

Supplementing conventional boundary organization theory, Miller (2001) offers the notion of “hybrid management” to describe the activities of boundary organizations in more complex, contested, and dynamic scientific and political settings. For Miller, hybrids refer to “social constructs that contain both scientific and political elements, often sufficiently intertwined to render separation a practical impossibility” (2001: 480). These scientific-political hybrids include material artifacts, practices, and organizations. “Hybrid management” consists of managing these hybrid forms – that is, combining scientific and political elements (“hybridization”), taking them apart (“deconstruction”), establishing and maintaining boundaries between different social worlds (“boundary-work”), and coordinating activities taking place in multiple worlds (“cross-domain orchestration”) (Miller, 2001: 487).

Although the boundary organization concept has been applied to a diverse array of organizations – e.g., public interest science organizations (Moore, 1996), technology transfer organizations (Guston, 1999), government agricultural extension offices (Cash, 2001), public bioethics bodies (Kelly, 2003), and expert advisory institutions (Miller, 2001; Fogel, 2002) – the concept has not been applied explicitly to NGOs. This is quite surprising given that a great deal of the social science literature on NGOs focuses on linkages (e.g., Bratton, 1990; Bebbington and Farrington, 1992, 1993; Farrington et al., 1993; Wellard and Copestake, 1993; Hulme and Edwards, 1997; Edwards and Fowler, 2002), accountability (e.g., Edwards and Hulme, 1996; Chaplowe and Madden, 1996; Fowler, 1997; Smillie, 1997), mediation (e.g., Keengwe et al., 1998; Markowitz, 2001; Carey and Richmond, 2003), and multilevel negotiation (e.g., Thomas-Slayter, 1992; Jasanoff, 1997; Igoe, 2003). Thus, a significant contribution of the present study is my analysis of NGOs as boundary organizations.

### *Boundary objects*

The “boundary object” concept emerged as a response to the question of how actors from different social worlds with diverse agendas and interests come together to get something done or produce new knowledge (see Gieryn, 1995; Fujimura, 1992). In a widely cited case study, Star and Griesemer (1989) found that individuals from different social worlds – e.g., amateur naturalists, professional biologists, philanthropists, conservationists, university administrators, government officials, and taxidermists – successfully worked together to create the Museum of Vertebrate Zoology at the University of California–Berkeley. The successful collaboration of these multiple social worlds was due, in part, to the creation and use of “boundary objects” defined as:

...those scientific objects which both inhabit several intersecting social worlds...**and** satisfy the informational requirements of each of them. Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting social worlds (Star and Griesemer, 1989: 393).

In coming together to accomplish a particular task, social worlds share a common goal (or reference point) yet maintain a degree of autonomy by defining and adapting boundary objects to meet their localized needs. Boundary objects can be material objects, organizational forms, people, projects, concepts, texts, or processes. Their common trait is that they span the boundaries separating social worlds and, consequently, facilitate communication and coherence across worlds. In other words, boundary objects serve as *interfaces* – “the means by which interaction or communication is effected at the places ‘where people meet’ or different social worlds intersect” (Fujimura, 1992: 178; also see Lamont and Molnár, 2002).

Case studies of the creation and use of boundary objects abound in the literature (e.g., Harvey and Chrisman, 1998; Bud, 1991; Balmer, 1996; Henderson, 1991; Frost et al., 2002). The boundary object concept has even been applied to organic compost. Gieryn (1999) describes the “Indore method of composting,” which involves mixing different kinds of organic waste in a strictly controlled fashion, as one component of Sir



Albert Howard’s “hybridized imperial economic botany” (mentioned above). A compost pile, Gieryn maintains, can be considered a “boundary object” because it exists between modern Western science and traditional Eastern wisdom. In other words, a compost pile – be it an Indore-style compost pile or a rural Kenyan compost pile – inhabits multiple social worlds. As a boundary object, a compost pile is able to adapt to local needs, yet maintain a common identity across social worlds.

### Organic agriculture in the global South

Organic agriculture is defined by the International Federation of Organic Agriculture Movements (IFOAM) as follows:

Organic agriculture is an agricultural production system that promotes environmentally, socially, and economically sound production of food and fibers, and excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, livestock feed and additives, and genetically modified organisms. Utilizing both traditional and scientific knowledge, organic agricultural systems rely on practices that promote and enhance biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain, or enhance ecological harmony (see <http://www.ifoam.org>).

The reference to the use of “both traditional and scientific knowledge” illustrates that organic agriculture spans the boundary between different knowledge domains. This is a significant characteristic of organic agriculture as an agricultural style. As I discuss below, while the GR pioneers rejected “traditional” knowledge in favor of proven science (an example of the expulsion and monopolization forms of boundary-work), organic agriculture proponents have incorporated indigenous/local knowledge into standard organic farming practices (an example of the expansion form of boundary-work).

Organic agriculture in the global South is commonly associated with an assortment of practices for enhancing soil fertility and controlling pests and diseases (Parrot and Marsden, 2002). Soil enhancement practices include composting, crop rotation, mixed cropping, deep digging, and agroforestry. Companion planting, biological controls, natural pesticides, and hand picking are examples of organic methods of pest and disease control. An organic farmer does not necessarily use all of these techniques, but rather chooses among them to use the natural materials found on a farm to make agricultural land more productive. The elimination of synthetic agricultural inputs in the absence of soil-building and natural pest/disease control practices does not qualify as organic farming (FAO, 1999; Scialabba, 2000; Scialabba

and Hattam, 2002). In addition, traditional slash and burn systems and other unimproved farming practices are generally not considered to be forms of organic agriculture.

It is important to distinguish between “certified” organic agriculture and “non-certified” (Scialabba and Hattam, 2002), “informal” (Parrott and Van Elzakker, 2003), or “de facto” (Parrott and Marsden, 2002) organic production. Certified organic agriculture implies compliance with specific production and processing requirements that dictate what can and cannot be labeled as “organic” in national, regional, or world markets. Non-certified organic farming – the focus of this paper – refers to “agriculture that meets organic production standards, but is not subject to organic inspection, certification, and labeling” (Scialabba and Hattam, 2002: 5). Non-certified organic producers follow the same organic principles as certified organic producers. For example, they actively conserve and enhance natural processes to protect crops and improve agricultural productivity (Scialabba and Hattam, 2002). Non-certified organic farming is especially prevalent in resource-poor or agriculturally marginal regions where farmers have no choice but to rely on locally available natural resources to maintain soil fertility and to combat pests and diseases (Parrott and Marsden, 2002). Most forms of non-certified organic agriculture target household food needs and local markets, without product or price differentiation.

Academic and policy interest in certified and non-certified organic agriculture in the global South has grown tremendously in recent years (see, e.g., Crucefix, 1998; FAO, 1999; Reynolds, 2000, 2004; Scialabba, 2000; Barrett et al., 2002; Parrott and Marsden, 2002; Bruinsma, 2003; Parrott and Van Elzakker, 2003; Scialabba and Hattam, 2002; Halberg et al., 2006; Willer and Yussefi, 2006). This increased attention is not surprising given the rapid growth of the organic agriculture sector in many Southern countries during the past 10–15 years. The impressive growth of certified organic agriculture in the South is due, in part, to the escalating demand for organic products in the North. The world market for organic products is valued at over US \$28 billion and growing at roughly 19% per year (Reynolds, 2004; Willer and Yussefi, 2006). Although exports of organic products from Southern countries to Northern markets represent only 5% of the world trade in organics, South-North trade is the fastest growing trade route (Reynolds, 2000, 2004). Certified organic imports from the global South are valued at over US \$500 million (Barrett et al., 2002).

Organic agriculture is severely underdeveloped in Africa in comparison to other low-income continents. Africa’s certified organically managed farmland – approximately 119,140 farms on 1,025,898 ha – represents a mere 0.2% of the continent’s total agricultural

land (Parrott et al., 2006). Ghana, Ethiopia, Kenya, Tanzania, Uganda, and Zambia have seen the greatest growth in certified organic land in recent years. In Kenya, an estimated 1,82,438 ha – or 0.7% of the country's agricultural land – is under certified organic management (Parrott et al., 2006). Most certified organic production in Kenya is carried out by large-scale farmers, aimed at export markets, and dependent on foreign inspectors.

Data on non-certified organic agriculture, particularly in the global South, is severely lacking. Parrott and Marsden (2002) suggest that IFOAM membership data offer a useful proxy method for estimating levels of certified and non-certified organic agriculture around the world. Their reasoning is that some IFOAM members participate in certified organic agriculture, while other members (especially those in Africa) engage solely in non-certified organic production. Analysis of IFOAM's membership data shows that three-quarters of the 750 individual and institutional members are based in the global South (FAO, 1999; Reynolds, 2004). Moreover, two-thirds of the recent growth in IFOAM membership is due to new Southern recruits (Parrott and Marsden, 2002). Kenya, despite having very limited certified organic land, currently has more IFOAM members than any other Sub-Saharan African country (IFOAM, 2005).

### NGO proliferation in the global South

The term “non-governmental organization” (NGO) was coined by the United Nations (UN) to refer to international bodies – with established headquarters, an executive organ, a democratically adopted constitution, and financial independence from government agencies – accredited to the UN for consulting purposes (Martens, 2002). In recent decades, however, the term NGO has been applied to a wide variety of organizations engaged *outside* the UN framework, such as advocacy organizations, human rights groups, village associations, grassroots environmental groups, church-based organizations, and farmer cooperatives. In sociological parlance, an NGO is a non-profit-making, nonviolent, durable organization (as opposed to a spontaneous force or movement) that does not include government representatives, depend on government funding, nor seek governmental power (Martens, 2002). The NGO sector includes both membership organizations (e.g., community-based or grassroots organizations) and non-membership organizations (e.g., organizations that offer services to individuals and communities). The present study focuses on a particular group of registered, non-membership, development-oriented NGOs: national and local Kenyan NGOs engaged in organic agriculture promotion, training, research, and extension.

The past two decades have seen an unprecedented proliferation of development-oriented NGOs in the global

South. These NGOs have filled the void left by the dual crises, particularly in Africa, of nascent and declining markets and weakened, corrupt, and inefficient states (Makoba, 2002). The extraordinary growth in the number of development-oriented NGOs worldwide is associated with the shift in donor attitudes about development assistance. NGOs are now widely believed to have a comparative advantage over state-led and market-led strategies in promoting grassroots social and economic development in the global South. They are perceived to be more flexible, more innovative, more participatory, more cost-effective, closer to the poor and marginalized segments of the population, more familiar with local environmental conditions, more sensitive to community values, more aware of gender issues, less bureaucratic, and less corrupt (see, e.g., Fowler, 1991; Chaplowe and Madden, 1996; Smillie, 1997; Markowitz, 2001; Makoba, 2002). For these reasons, many international donors prefer to channel development aid through NGOs rather than state institutions. NGOs in some African countries provide or implement more than one-fifth of total aid flows (Makoba, 2002).

Kenya has the largest NGO sector in Africa (Kanyinga, 1995). During colonial times, the majority of NGOs were either church-based organizations that combined evangelical work with various education and social welfare activities or urban-based welfare organizations (Kanyinga, 1995). After independence in 1963, secular NGOs, focused first on flood and famine relief and later on development activities such as the provision of health care and water, emerged. The 1980 and 1990s saw unprecedented growth of all components of Kenya's NGO sector: service NGOs set up for targeted beneficiaries, horizontal NGOs (e.g., the National Council of NGOs), community membership-based organizations (e.g., women's groups, youth clubs), and church-based organizations (e.g., National Council of Churches of Kenya) (Osodo and Matsvai, 1998). The number of registered Kenyan NGOs increased from 124 in 1975 to approximately 400 in 1987 to over 2,500 in 2003 (Ndegwa, 1994; Kanyinga, 1995; WRI, 2003). The rapid increase in the number of NGOs has been attributed to the effects of structural adjustment programs imposed by the International Monetary Fund, the state's inability to meet the basic needs of the majority of the Kenyan population, the escalation of socioeconomic problems (e.g., poverty, civil strife, and economic decline), and the increase in official aid available to NGOs. At present, NGOs operate 50% of the hospitals and 87% of health clinics in the country (WRI, 2003). Similar trends are evident in other development sectors, such as education and agriculture.<sup>1</sup>

In recent decades, NGOs have become increasingly involved in agricultural development activities, especially efforts focused on sustainable/organic farming methods, in the global South. Moreover, NGOs have assumed roles

and activities (e.g., agricultural research, technology development, and extension) formally undertaken primarily, if not exclusively, by state organizations. The growth in the number of NGOs in agricultural development, particularly organic agriculture efforts, has proceeded to an especially impressive degree in Kenya. As I discuss below, national and local NGOs dominate nearly all aspects of organic agriculture promotion, training, research, extension, and marketing.

### **Emergence of organic agriculture NGOs in Kenya**

For the past two decades, indigenous NGOs have been promoting environmentally, economically, and socially sustainable agricultural alternatives to high external input (or “Green Revolution”) agriculture to the rural poor throughout Africa, Asia, and Latin America (Farrington et al., 1993; Wellard and Copestake, 1993; Shrum, 2000). Kenya is no exception. National and local NGOs have played a significant role in organic agriculture promotion, training, research, and outreach since the 1980s. Organic agriculture NGOs emerged because of widespread discontent with the research orientation, technology dissemination practices, and social/environmental externalities associated with the GR regime. Stories about the “failure” of the GR regime – part of the larger critique or “deconstruction” of formal agricultural technoscience – created space for new institutions (NGOs), new agricultural ideas (e.g., organic farming), new research methods (e.g., participatory approaches), and new information dissemination strategies (e.g., farmer-to-farmer training) (Kloppenborg, 1991; Shrum, 2000). However, organic agriculture NGOs have not operated in isolation from the donor organizations and technoscientific agricultural institutions that were so central to the GR regime. Linkages between organic agriculture NGOs and donors, research institutes, universities, and public extension providers have been essential to the successful operation of Kenya’s organic agriculture NGO sector.

#### *The Green Revolution regime*

During the 1960 and 1970s, the so-called “Green Revolution” swept through Asia, Latin America, and parts of Africa. The GR technological package included high-yielding varieties of wheat, rice, and maize, in combination with synthetic fertilizers, chemical pesticides, herbicides, fungicides, and irrigation technologies. The primary objective of the GR was to modernize agricultural technology, thereby increasing agricultural productivity in countries experiencing rapid population growth and declining yields. The institutional framework for carrying out the GR in the South encompassed donor organizations, international agricultural research centers

(particularly those associated with the Consultative Group for International Agricultural Research or CGIAR), national research institutes, and public agricultural education, research, and extension services modeled after the US land-grant system.

Shrum (2000) associates the GR technological style or regime with a particular “story” about agricultural development. Central to the GR story was the devaluation of “traditional” farmer knowledge and demonstration of the superiority and authority of “modern” technoscientific agriculture. In the same way that the establishment of the land-grant system and the “scientization” of agriculture transformed US farmers from generators to recipients of knowledge (Kloppenborg, 1991), the GR regime rejected farmer-generated, locally adapted agricultural knowledge and practices built up over the centuries in Asia, Latin America, and Africa. Thus, I contend that the GR era was a period of strategic boundary-work by the GR pioneers in collaboration with donor organizations, agricultural scientists (at both the international and national levels), and public extension agents. GR boundary-work involved “expulsion” (the exclusion of farmers from the authoritative cultural space occupied by “real” agricultural science) and “monopolization” (the delineation of authoritative agricultural knowledge and denial of authority to outsider claims) (see Gieryn, 1983, 1995, 1999).

The GR technological style took hold in Kenya in the 1960s and continues to play a significant role in public agricultural research and extension. For example, by 1990, domestically produced maize hybrids comprised 62% of total maize acreage, with yields 40% higher than conventional varieties (Asiema, 1994). Reasons for the relative success of the GR in Kenya include readily available donor funds, the presence of several international agricultural research centers, and the establishment of public agricultural colleges, national agricultural research facilities (e.g., Kenya Agricultural Research Institute and Kenya Forestry Research Institute), and public agricultural extension services. The Kenyan GR regime has also been bolstered by the existence of national and multinational agribusiness firms such as seed companies, fertilizer manufacturers, agricultural chemical dealers, and networks of agricultural crop/input importers, exporters, and middlemen.

Despite the technological advances associated with the GR, the story that has emerged since the 1980s is largely one of “failure” (Shrum, 2000). For example, Kenya has faced major food shortages during the past four decades. Household food security has been compromised because GR agricultural advances have neglected natural soil fertility, promoted external dependence, generated increased socioeconomic inequality, and eroded indigenous farmer knowledge. Because of its capital-intensity and export-orientation, the GR technological style favored medium and large-scale farmers with access to adequate cash, capital, and credit. Smallholders were

forced to struggle economically and technologically to keep up with wealthier, larger farmers.

The GR approach to technology transfer – i.e., the translation of scientific knowledge claims into producer practices by agricultural extension providers – has been considered by many to be another significant failure of the GR in the global South, including Kenya (Shrum, 2000). Such top-down translation requires “strenuous efforts and substantial resources” and is a “significant challenge where peasant farmers are many, research formations are new and resources for extension are few” (Shrum, 2000: 103). By the 1980s, the story told within the development community of the failure of GR technology transfer centered on the weaknesses of extension services and research institutes rather than on the failure of farmers to adopt GR technologies. Many Kenyan farmers came to see the GR regime, including the public system of agricultural research and extension, as simply not adequately meeting their needs.

### *Creating space for organic agriculture NGOs*

The numerous stories of the failure of the GR – which can be considered part of the “deconstruction” (Kloppenborg, 1991) of the GR regime as well as formal agricultural science – opened up space for alternative institutions, sustainable farming methods, and innovative extension approaches.<sup>2</sup> In Kenya, the inability of the GR regime to guarantee sustainable rural livelihoods (particularly household food security) inspired the search for alternative agricultural methods that could meet the needs of Kenya’s growing population. Organic agriculture, which relies partly on indigenous knowledge and practices, has been put forth by many agriculturalists, development practitioners, and social scientists as one such alternative for small-scale food producers (see, e.g., Altieri and Anderson, 1986; Francis et al., 1986; Tibaldi, 1992; Crucefix, 1998; Parrott and Marsden, 2002; Scialabba and Hattam, 2002). Organic agriculture proponents argue that the sustainable use of local resources raises household income through the reduction in costly external inputs, increases agricultural production through enhanced soil fertility, improves family health through the elimination of dangerous agrochemicals, and helps guarantee household food security.

The proposed economic, environmental, and social benefits of organic agriculture caught the attention of numerous Kenyan NGOs and agricultural professionals beginning in the mid-1980s. As a new organizational form on the agricultural development scene, NGOs have been able to draw upon a “new story set involving ‘participation’ and ‘sustainability’” to attract multilateral and bilateral donors eager to fund “alternative” agricultural projects (Shrum, 2000: 106). NGOs involved in sustainable agriculture efforts in Kenya (and elsewhere) have capitalized on their embeddedness in specific localities and have emphasized sustainable development over profit, partici-

patory methods, bottom-up development, and moral (rather than scientific) authority (Shrum, 2000). As I discuss below, organic agriculture NGOs have engaged in the “expansion” variety of boundary-work (see Gieryn, 1983, 1995, 1999) – they have extended the boundaries of agricultural science by giving voice to farmers whose wealth of knowledge was devalued during the GR era. In fact, the term “organic” has been applied to practices that were previously labeled as “traditional” and “non-scientific.”

In Kenya, organic agriculture NGOs – rather than public sector institutions (e.g., governmental departments, parastatals, international agricultural research centers) and private sector actors (e.g., agricultural input suppliers, pest control consultants) – constitute the primary delivery system of organic agriculture information because of their regular training of individual farmers, self-help groups, and other interested parties (Rees et al., 2000). These NGOs are working in opposition to the GR regime and the global agro-food system by establishing alternative research themes, linkages, and institutions; by promoting community embeddedness; and by encouraging participatory methods for identifying and tackling the problems faced by Kenyan smallholders (see Shrum, 2000). They have begun to influence national agricultural policy, the agricultural programs of international NGOs, and even the agricultural practices of neighboring Ugandan and Tanzanian farmers. Moreover, they have been instrumental in developing national organic standards (KIOF, n.d.; ABLH, 1999; EPOPA, 2004).

The major players within Kenya’s organic agriculture NGO sector are the Kenya Institute of Organic Farming (KIOF), Manor House Agricultural Centre (MHAC), the Association for Better Land Husbandry (ABLH), Baraka Agricultural College, the Sustainable Agriculture Community Development Program (SACDEP), and the Sustainable Agriculture Centre for Research and Development in Africa (SACRED). Table 1 provides summary information – year of founding, primary activities, geographic focus, and selected donors – for these six influential NGOs. Together these organizations have trained tens of thousands of farmers, self-help group members, agricultural extensionists, and NGO representatives across the country. Most organic agriculture efforts in Kenya can be traced directly or indirectly to one or more of these organizations.

### **Organic agriculture NGOs as boundary organizations**

National and local NGOs play a central role in organic agriculture promotion, training, research, and extension in Kenya. Linkages with foreign donors, international and national agricultural research institutes, universities, farming communities, and the Kenyan state are essential to NGOs’ objective of promoting organic agriculture among smallholders. Thus, I argue that organic agriculture NGOs in Kenya can be considered boundary organiza-



**Table 1.** Leading organic agriculture non-governmental organizations in Kenya.

Name <sup>a</sup>	Founded	Primary activities <sup>b</sup>	Geographic emphasis <sup>c</sup>	Selected donors
ABLH	1992	T, R, E, M, C, O	<ul style="list-style-type: none"> <li>• Kirinyaga (Central)</li> <li>• Busia, Kakamega, Vihiga (Western)</li> </ul>	<ul style="list-style-type: none"> <li>• Department for International Development (UK)</li> <li>• Ford Foundation</li> <li>• Rockefeller Foundation</li> </ul>
Baraka	1974	T, E, M	<ul style="list-style-type: none"> <li>• Nakuru (Rift Valley)</li> </ul>	<ul style="list-style-type: none"> <li>• US Agency for International Development</li> </ul>
KIOF	1986	T, R, E, C, O	<ul style="list-style-type: none"> <li>• Kirinyaga (Central)</li> <li>• Embu, Machakos, Makueni (Eastern)</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination in Development, Inc. (NY)</li> <li>• Humanist Institute for Cooperation with Developing Countries (Netherlands)</li> <li>• Ministry of Foreign Affairs (Netherlands)</li> </ul>
MHAC	1984	T, R, E, C	<ul style="list-style-type: none"> <li>• Western Kenya</li> </ul>	<ul style="list-style-type: none"> <li>• Conservation, Food, and Health Foundation (Boston)</li> <li>• Ford Foundation</li> </ul>
SACDEP	1992	T, R, E, M, C	<ul style="list-style-type: none"> <li>• Murang'a, Thika (Central)</li> <li>• Machakos, Mwingi (Eastern)</li> </ul>	<ul style="list-style-type: none"> <li>• UN Development Programme</li> <li>• Ford Foundation</li> </ul>
SACRED	1994	T, R, E, M, C	<ul style="list-style-type: none"> <li>• Bungoma, Teso (Western)</li> </ul>	<ul style="list-style-type: none"> <li>• British Council</li> <li>• Department for International Development (UK)</li> <li>• Rockefeller Foundation</li> <li>• Tudor Trust (UK)</li> <li>• UN Food and Agriculture Organization</li> </ul>

<sup>a</sup>ABLH = Association for Better Land Husbandry (Nairobi), Baraka = Baraka Agricultural College (Molo), KIOF = Kenya Institute of Organic Farming (Juja), MHAC = Manor House Agricultural Centre (Kitale), SACDEP = Sustainable Agriculture Community Development Programme (Thika), SACRED = Sustainable Agriculture Centre for Research and Development in Africa (Bungoma). <sup>b</sup>T = training, R = research, E = extension, M = marketing, C = consultancy, O = organic certification. <sup>c</sup>Refers to the primary geographic emphasis of extension activities. In most instances, district names are provided with province names in parentheses.

tions, which, as discussed above, are institutions that (1) exist at the intersection of multiple social worlds with definite lines of responsibility and accountability to each world, (2) involve the participation of actors from different social worlds, as well as specialized mediators, (3) mediate information flows across different levels of organization, and (4) provide a space for the creation and use of boundary objects and hybrid forms (Guston, 1999, 2000; Cash, 2001; Miller, 2001). I discuss each of these four defining characteristics in turn.

#### *Multiple social worlds*

As service-oriented, donor-driven, government-regulated organizational entities, organic agriculture NGOs have different lines of responsibility and accountability to three primary social worlds: small-scale farmers, foreign donors, and the Kenyan state. First, organic agriculture NGOs serve Kenya's rural poor through the promotion of an alternative to the GR regime, which negatively affected (or bypassed) the majority of the country's smallholders.

Organic agriculture NGOs assist farming communities through workshops, farming demonstrations, publications, outreach, on-farm experiments, and marketing opportunities. Farming communities depend on NGOs for not only organic agriculture information, but also ongoing support and encouragement. The ultimate success of Kenya's organic agriculture NGOs is contingent, in part, upon farmers' satisfaction with the training, extension, marketing, and other services provided by NGOs.

Second, organic agriculture NGOs depend on funding from foreign governments, foundations, Northern NGOs, and individual donors. For example, KIOF has a long-standing relationship with the Dutch Ministry of Foreign Affairs; MHAC, ABLH, and SACDEP have relied on the generosity of the Ford Foundation; and SACRED's programs have been funded by the UK-based Tudor Trust, British Council, and Department for International Development (see Table 1). These donors have chosen to bypass the Kenyan government (the favored recipient of donor funds during the GR era) and channel funds directly to national and local NGOs, the primary promoters of

sustainable agriculture in Kenya. The acceptance of donor funds by organic agriculture NGOs dictates a certain level of responsibility and accountability to donor organizations. For example, NGOs are often required to produce results, quantify outcomes, evaluate successes and failures, and generate reports.

Finally, organic agriculture NGOs are linked to the Kenyan state in several ways. As registered NGOs, they must operate according to a strict regulatory framework set by the Kenyan government (see Kameri-Mboti, 2000). In addition, despite their opposition to the GR regime (which was tied heavily to the public agricultural research and extension system), organic agriculture NGOs are productively linked to the state in various ways. For example, Ministry of Agriculture extension agents participate occasionally in NGO-sponsored organic agriculture workshops and, consequently, broaden their views on what constitutes “acceptable” agricultural practice. Organic agriculture NGOs engage in community outreach activities in collaboration with government extension agents. Some organic agriculture NGOs have even collaborated with the Kenya Agricultural Research Institute, the primary agricultural research arm of the government, on various organic agriculture research projects (see KARI, 1997). Organic agriculture NGOs (e.g., KIOF, ABLH) are also beginning to work with the Kenyan government to develop a national system of organic standards.

#### *Principals, agents, and specialized mediators*

Organic agriculture NGOs in Kenya involve the participation of actors from different social worlds in a variety of ways. Guston (1999) describes these social actors as “principals” (i.e., patrons or sponsors), “agents” (i.e., performers), and “specialized mediators.” In the case of organic agriculture in Kenya, foreign donors (e.g., foundations, foreign governments, and Northern NGOs) are the primary principals and farmers are the primary agents. Situated between donors, farmers, and other stakeholders (e.g., agricultural institute scientists and university-based researchers) are organic agriculture NGO staff members who facilitate dialogue and translate information across worlds.

Two groups of NGO staff members are particularly important as mediators: executive directors and grassroots field workers. An NGO’s executive director – as networker, grant writer, conference participant, and research collaborator – is often the organization’s primary link to foreign donors and the national government. The NGO leader represents the organization to the world beyond the local community. For example, the director of KIOF is a respected agronomist, researcher, conference speaker, and published writer (Donisthorpe and Njoroge, 1993; Njoroge, 1994; Kihia and Njoroge, 1995; Njoroge and Manu, 1999) in the eyes of foreigners and the Kenyan government. The field staff employed by organic

agriculture NGOs serve equally important roles as mediators. Often of the same ethnic group as local community members, field workers (e.g., outreach specialists, community-based trainers, and on-farm researchers) link NGOs to individuals and farming groups at the local level.

One of the biggest challenges for NGO leaders is preventing linkages with outsiders from weakening relationships with local communities. In reference to Tanzanian NGOs, Igoe (2003: 881) worries that “NGO leaders become gatekeepers between western donors and the communities that they wish to assist. More energy is spent in accommodating donor ideas and meeting reporting requirements than in empowering local people. Communities become commodities of an international NGO industry, rather than active participants in...civil society.” It is not uncommon for NGO leaders to be torn between “often-unrealistic demands of their donors” and the “often-unrealistic expectations of their local constituents” (Igoe, 2003: 868). Thus, assuming the role of mediator does not necessarily imply *success* at catering to everyone’s needs nor facilitating dialogue and coordination across social worlds and knowledge domains.

#### *Multilevel information flows*

Organic agriculture NGOs can also be considered boundary organizations because they facilitate multi-directional information flows across different levels of organization (e.g., local, national, and international levels) (see Cash and Moser, 2000; Cash, 2001). Embedded in specific localities, organic agriculture NGOs are able to tap into stores of local knowledge through their interactions with farmers and other community members. Because NGOs can “gain access to domains of localized experience and understanding,” they “constitute a vehicle for scaling knowledge up from the grass roots” (Jasanoff, 1997: 591). In other words, they bring local knowledge and practice into national and international discussions of organic agriculture. Organic agriculture NGOs also mediate flows of information from the international, national, and regional levels to the local level. Oftentimes they translate generalized scientific information into site-specific recommendations for farmers.

#### *Creation and use of boundary objects and hybrid forms*

Finally, as boundary organizations, organic agriculture NGOs provide a space for the creation and use of boundary objects and hybrid forms. Both boundary objects and hybrid forms serve as interfaces for cross-world communication and cooperation. The dynamic creation and management of boundary objects and hybrid forms by organic agriculture NGOs are essential to developing and maintaining cohesion across multiple social worlds. I present examples

of the boundary objects and hybrid forms created and used by Kenya’s organic agriculture NGOs in the next section.

### Building bridges

Organic agriculture NGOs mediate between multiple social domains in order to facilitate communication and cooperation in the interest of a shared objective (i.e., the diffusion and adoption of organic farming methods among Kenyan farmers). One method of achieving cross-world cohesion is through the creation, use, and maintenance of boundary objects and hybrid forms that bridge and/or integrate multiple worlds and knowledge domains. Examples of boundary objects and hybrid forms include the notion of “organic agriculture” itself and the Forum for Organic Resource Management and Agricultural Technologies (FORMAT). As I explain below, organic agriculture (and its constitutive parts) and FORMAT serve as reference points for the multiple social worlds involved in the promotion of sustainable alternatives to the capital-intensive, environmentally destructive GR regime.

#### *Organic agriculture and its constitutive parts*

Earlier I presented the official IFOAM definition of organic agriculture, which states that organic agricultural systems “utiliz[e] both traditional and scientific knowledge” (see <http://www.ifoam.org>). The fusion of science and traditional knowledge is a popular theme in organic agriculture discourse in Kenya. For example, a KIOF representative writes:

Success in development is more likely to be achieved when traditional knowledge systems are fused with modern technology. Traditional knowledge is dynamic and well adapted to local circumstances, forming the basis for people’s day-to-day decision-making... Traditional knowledge is strong on the practical side but sometimes has a weak theoretical foundation, making it difficult for it to be applied more widely... [O]rganic farming is a blend of traditional and modern farming systems. Traditional practices enabled communities to farm for generations before the introduction of modern technologies. This traditional wisdom needs to be documented and its value reinforced... Farmers have long been using plant and animal manures, but guidance on optimal timing, placement, and quantity was needed... Intercropping and crop rotation are other traditional practices where science can support the traditional process of trial and error (Mihindo, 1997: 96–97).

Thus, organic agriculture spans the boundary between traditional/modern and local/global. It intertwines both substantive and methodological components of traditional knowledge/practice and modern science. The

hybrid nature of organic agriculture – almost to the point of inseparability of the “traditional” and “modern” components – characterizes organic agriculture as an agricultural style. The combination of traditional and scientific knowledge and practices into a single agricultural system represents a significant departure from the GR era when farmer wisdom was essentially ignored in favor of generalized agroscientific knowledge. As mentioned above, the “monopolization” and “expulsion” varieties of boundary-work conducted by the GR pioneers have given way to “expansion” boundary-work by organic agriculture NGOs.

Organic agriculture in toto in Kenya can be conceptualized as a boundary object or “object of social action” (Moore, 1996: 1598) for multiple social worlds. As such, it serves as a means of cross-world communication (i.e., a shared reference point) even though it means different things to different social actors. For a Kenyan NGO, organic agriculture may mean a sustainable alternative to the GR technological style that negatively affected small-scale farmers and the environment. For many foreign donors, organic agriculture is a means to achieve broader development goals, such as sustainable livelihoods, resource conservation, poverty alleviation, and biodiversity protection. For scientists, organic agriculture may be equated with respect for natural ecological balances. For national governments, organic agriculture may mean foreign exchange or food security. For consumers, organic agriculture often means safer, healthier, and tastier food. Finally, for farmers, organic agriculture may mean all of the above: a sustainable farming method, respect for nature, increased income, improved food security, and healthier food.

John Wanjau Njoroge, the director of KIOF, offers a list of some of the different meanings attributed to organic agriculture by farmers, NGOs, and others involved in organic farming pursuits in Kenya (see Figure 1). He then provides a list of the meanings of organic agriculture for social actors outside the Kenyan context (e.g., western consumers, environmental lobbyists, foreign donors, and processors/distributors of certified organic produce). I quote Njoroge’s essay at length because it illustrates a Kenyan organic agriculture NGO’s awareness of the different meanings of organic agriculture held by different social actors. The passage presented in Figure 1 suggests that Kenyan organic agriculture NGOs perceive (or, in fact, have created) a boundary between Kenyan meanings of organic agriculture and “out there” (i.e., western) perspectives. Nevertheless, organic agriculture, defined here as a boundary object, serves as a meeting ground for socially and geographically disparate social actors, such as farmers, donors, NGOs, and agricultural scientists. Organic agriculture may have different meanings in different social worlds, but its “structure is common enough to more than one world to make [it] recognizable” across worlds (Star and Griesemer, 1989: 393).

- “Kenyan farmers, institutions, NGOs, and church organizations have taken organic agriculture to mean different things to them. Some of these are:
1. Organic farming is **reduced costs in agriculture** ... farmers see organic farming as a method that is affordable and manageable.
  2. It is **recycling of organic matter** ...
  3. Organic farming in Kenya is **conservation of resources** ...
  4. Organic farming is **improved soil medium**. It is double digging, deep digging, and other alternative soil cultivation methods.
  5. It is **increased food production** and **poverty alleviation** ...
  6. It is **improved livestock production** using balanced feeds, herbal treatment, and keeping the animals according to their nature.
  7. Organic farming is **appropriate technology** and **homemade ‘do it yourself’ technologies** that make the farmer self-sufficient ...
- Out there organic farming is:
- A. **Healthy food** – there are countless supermarkets and food shops selling organic food.
  - B. It is **environmental or bio-diversity protection** – hundreds of farmers are paid not to farm but to leave their farms for natural vegetation to take over ...
  - C. It is a **niche market for organically grown products** ...
  - D. Organic farming is **business** – countless businesses have been set up dealing with production, processing, certification and inspection to supermarkets and distribution systems.
  - E. It is a **subject for intensive lobbying** – from lobbying for banning or restriction of various pesticides to exclusion of genetically modified organisms (GMOs) ...
  - F. It is **conferences and numerous workshops** related to the promotion of organic agriculture.
  - G. Organic farming is **opportunity for donor funding** – whether the funds do projects in the South or in the North ...”
- (Njoroge 2001, my emphasis).

**Figure 1.** Different meanings of organic agriculture in Kenya and beyond.

Not only does organic agriculture in toto contain traditional and scientific elements, but also its constitutive parts are often hybrid forms as well. A good example is composting, one of the mainstays of organic agriculture in Kenya. Composting in general refers to turning organic material into valuable plant food (or humus), which improves soil fertility, moisture retention, and soil aeration. As Gieryn writes, “just as composting is itself a mix of heterogeneous ingredients, so too does it mix up and even decompose the cultural spaces and boundaries through which we interpret it” (1999: 234). Thus, composting can be considered a hybrid form (or, alternatively, a boundary object) because it exists “in the liminal spaces between Western science and Eastern wisdom, between universal and local, between knowledge and practice, between traditional and modern” (Gieryn, 1999: 234).

*Forum for Organic Resource Management and Agricultural Technologies*

Boundary objects and hybrid forms not only include concepts, material objects, and practices, but also organizational arrangements. An example of the latter is the Forum for Organic Resource Management and Agricultural Technologies (FORMAT), an initiative developed by members of Kenya’s organic agriculture NGO community to increase awareness, facilitate information sharing, and forge collaborative linkages with respect to

organic resource management in both rural and urban areas. As the FORMAT website explains:

Many innovative organizations including farmer associations, agricultural extension, development NGOs, and research scientists are examining organic resource management technologies in diverse locations, but too often in isolation from one another. Individuals and organizations working in isolation are less able to benefit from the experiences and accomplishments of others. Nonetheless, considerable progress is being made in numerous areas and tested management practices, information packages, and new products are now available to farmers, development groups, and private sector interests. Kenya’s research and development community has recently benefited from [FORMAT] as an opportunity to express resource management philosophies, compare promising technologies, and obtain or exchange recently development products (FORMAT, 2005a).

FORMAT revolves around a series of annual “countrywide events” where organic agriculture innovators set up exhibits focused on sustainable agriculture, integrated resource management, value-added processing, waste recycling, indigenous plants, environmental protection, and other topics. These events feature exhibits, presentations, demonstrations, and contests. They are open to the general public and serve as meeting grounds for entrepreneurs, researchers, farmers, NGO representatives,



policy makers, and development specialists from Kenya and elsewhere. Nearly 600 people attended the first three FORMAT events in 2000, 2001, and 2002 (Omare and Woomeer, 2002). Because of this initial success and thanks to continued support from the Rockefeller Foundation, nine FORMAT events were held in seven provinces in 2004. These nine events attracted 158 presentations, 474 exhibits, and 6,352 participants (FORMAT, 2005b).

FORMAT represents a commitment among members of the NGO community – and, in recent years, various government departments, businesses, and churches who have volunteered to help organize and publicize countrywide events – to find effective ways to span the boundaries separating grassroots groups, the private sector, policy makers, and other stakeholders. Thus, I argue that FORMAT, developed and managed by organic agriculture NGOs in their role as boundary organizations, is both a boundary object and hybrid form. As a boundary object, FORMAT facilitates interaction among multiple social actors who share a common interest in organic resource management. FORMAT events “open channels for communication among different interests working on related activities and towards common ends” (Omare and Woomeer, 2002: 238). However, different social actors may attribute different meanings to FORMAT – e.g., a learning experience, a marketing outlet, a form of publicity, a networking opportunity, a competition, a forum for discussion. As a hybrid form, FORMAT combines “scientific” and “traditional” knowledge domains. For example, in 2004, FORMAT organized a workshop on the technical aspects of carbon sequestration, on one hand, and a symposium on traditional green vegetables, on the other hand. Both events were attended by farmers, government workers, NGO representatives, scientists, and businesspeople (see <http://www.formatkenya.org> for more information).

### Scientization of organic agriculture

The above discussion demonstrated that national and local organic agriculture NGOs in Kenya have effectively bridged the lay/expert, traditional/modern, local/global divides through the creation and use of boundary objects and hybrid forms. However, in addition to building bridges across social and geographic divides, organic agriculture NGOs engage in “strategic boundary-work” to sufficiently “scientize” organic agriculture in order to attract donor support and collaborate with formal agro-scientific institutions (e.g., international agricultural research centers, universities, and public agricultural research and extension bodies).<sup>3</sup> The director of SACRED, one of Kenya’s leading organic agriculture

NGOs, explains the impetus for scientization in further detail:

NGOs...are in **dire need of scientifically proven information** to use and share with others. As one NGO worker said at a recent workshop: “There have been many cases of NGOs...peddling rumors instead of real scientific information.” Exaggeration of what works and what does not has also been rampant. There are many claims about what organic pesticides exist for the control of crop and livestock pests and diseases in the field. But field trials in the farmers’ fields show that few are actually effective. What is needed is **reputable information** of what works, with what crops and pests, what concentrations, and how often it should be repeated, etc. Considering that the number of farmers taking up organic farming has been growing rapidly of late, there is need to provide them with **professional support** and back up. In doing this, there is need for **real collaboration** between grassroots NGOs...with national and international research and development organizations (Mukhwana, n.d., my emphasis).

Another NGO director similarly stresses the need for what he calls “organic agriculture intellectuals” who can collaborate with farmers to validate organic agriculture via experiments and trials (interview, J. Kiilu, 2001).

Sociologists who have studied environmental and sustainable agriculture NGOs in international settings also emphasize that the scientization of local knowledge is often necessary for acceptance by donors, researchers, government officials, and other social actors situated outside local settings. For example, Jasanoff states that NGOs have the ability to “gain access to domains of localized knowledge and understanding...that currently remain outside the purview of organized science,” yet this knowledge must “pass through processes of validation and standardization, including perhaps translation into mathematical or statistical language, in order to achieve authority outside its places of origins” (1997: 591). Moreover, Shrum explains that “entry into the global framework of technoscientific institutions occurs more readily when old forms are employed, when consensual practices are adopted, and when paradigms are readily understood by others who may provide funds or partnerships in research” (2000: 116).

Most of the boundary-work performed by organic agriculture NGOs in Kenya takes the form of “expansion” (Gieryn, 1983, 1995, 1999), whereby the boundaries of formal agricultural science are redrawn to include ways of knowing that were previously considered “traditional” or “non-scientific.” Below I discuss two examples of expansion or scientization: (1) the carrying out of scientifically rigorous agro-economic research by NGOs in partnership with state agencies and international agricultural research

institutions and (2) the establishment of standardized measurements for many organic agricultural practices.

### *Scientific agro-economic research*

Association with methodologically sound research practice is one way in which organic agriculture NGOs in Kenya have sought to “scientize” and thus “legitimize” organic agriculture and its associated practices. The development of “scientific” organic agriculture research was spurred in part by donors’ desires for *evidence* of the superiority of organic agriculture over the GR technological style. Potential adopters also want proof that organic agriculture will perform better than conventional farming practices. Kenyan NGOs have turned to international and national agroscientific institutions to assist with organic agriculture research. As Shrum explains: “[s]ince association with research practice makes knowledge scientific, research need not necessarily be performed *within* NGO boundaries. Research conducted in collaboration with institutes and universities, adaptations of experiments, on-farm experimentation with NGO assistance, are all sufficient” (2000: 108).

An extremely popular topic of collaborative research has been the agro-economic performance of organic agriculture compared to conventional farming systems under different agroecological conditions in Kenya. Most of the published agro-economic studies report findings from on-going collaborations among researchers associated with the Kenya Institute of Organic Farming (KIOF), Education Training Consultants (ETC-Netherlands), the Agricultural Economics Research Institute (LEI-DLO), and the Kenya Agricultural Research Institute (KARI) (see Van der Werf et al., 1997; Diop et al., 1998; Onduru et al., 1998, 1999, 2001, 2002, 2006; Nandwa et al., 2000; De Jager et al., 2001; Gachimbi et al., 2002). Significant research projects have included “Potentials of Low External Input and Sustainable Agriculture to Attain Productive and Sustainable Land Use in Kenya and Uganda” (LEINUTS) coordinated by the Dutch research institute, LEI-DLO, and “Towards Organic Farming for East Africa” coordinated by KIOF and ETC-Netherlands.

Findings from analyses of the agro-economic performance of organic farming techniques compared to their conventional equivalents suggest that organic agriculture may be a viable and sustainable option for Kenyan smallholders, especially in areas of low or medium agricultural potential (see, e.g., Van der Werf et al., 1997; Diop et al., 1998; Onduru et al., 2002, 1999). For example, KIOF and ETC-Netherlands researchers, employing matched pairs of organic and conventional farms, found that the use of compost, double dug beds, and liquid manure for maize production medium-potential areas outperformed conventional practices in terms of

maize grain yields, new cash benefits, return to capital, and return per family labor day (Van der Werf et al., 1997; Diop et al., 1998). Other researchers have investigated organic agriculture’s potential contribution to soil fertility regeneration (see Nandwa et al., 2000; De Jager et al., 2001; Onduru et al., 2001, 2002, 2006). The combined use of compost and liquid manure appears to have a positive effect on partial nitrogen balances in both low- and high-potential agricultural areas, while the application of uncomposted manure and mineral fertilizers does not significantly improve nitrogen balances in either agro-ecological zone.

The highly “scientific” nature of the above agro-economic research is evidenced by its agronomic bent, matched-pair methodology, production of evidence, and presentation of results in scientific journals (e.g., *Biological Agriculture and Horticulture* and *Agricultural Systems*). This scientifically rigorous research – conducted by NGOs in partnership with state agencies and international agricultural research institutions – has been central to the validation and legitimation of Kenyan organic agriculture, especially to donors, scientists, and others situated outside local farming communities and the organic agriculture NGO sector.

### *Standardized organic agriculture measurements*

An extraordinary number of measurements are associated with the practice of organic agriculture in Kenya. Double dug beds should be 1.5 m wide, 7 m long, and 60 cm deep. To make liquid manure, 50 kg of manure should be placed in 200 l of water for 15 days. A basket compost should be a circular hole with a 60-cm diameter and 60-cm depth. A trench compost should be filled with 15 cm of dry vegetation, 15 cm of green vegetation, and 8 cm of cow dung or compost. To make a pyrethrum-based natural pesticide, 500 g of pyrethrum flowers should be boiled in 4 l of water. Organic agriculture training materials (e.g., Njoroge, 1994; Vukasin et al., 1995; IIRR, 1998; Njoroge and Manu, 1999) are teeming with precise measurements such as these.

This obsession with precise measurement among both organic agriculture promoters and farmer-adopters is an outcome of NGO boundary-work and another example of the scientization of Kenyan organic agriculture. Standardized measurements are the result of decades of organic agriculture research and practice by NGOs, farmers, development practitioners, sustainable agriculture experts, agricultural scientists, extensionists, and other social actors. They have become an essential part of the organic agriculture discourse as presented in workshops and demonstrations organized by organic agriculture NGOs throughout Kenya. The existence of such measurements lends a scientific veneer to NGO-promoted organic agriculture by implying that there is a body of

verified scientific research that documents the optimization of each organic agriculture technique. Standardized measurements reassure potential adopters that organic agriculture is a well-researched, scientifically proven system of farming.

Organic agriculture measurements are not only an outcome of the scientization of organic agriculture, but also good examples of “standardized forms.” Standardized forms are “boundary objects devised as methods of common communication across dispersed work groups [or] what Latour would call ‘immutable mobiles’ (objects which can be transported over a long distance and convey unchanging information)” (Star and Griesemer, 1989: 411). As standardized forms, organic agriculture measurements reflect agreed upon procedures for carrying out specific tasks across multiple “communities of practice” (Bowker and Star, 1999) or sites of activity. Thus, they facilitate communication and promote cooperative work across different social worlds, while offering a high degree of stabilization (i.e., fewer divergent uses, interpretations, and reconstructions).

Fieldwork in eastern Kenya provided valuable insight into farmers’ experiences with organic agriculture measurements. My observations of several NGO-sponsored organic agriculture workshops confirmed that workshop leaders tend to bombard farmers and self-help groups with numerous measurements in an effort to “technify” organic agriculture. Nearly every organic farming technique – from double dug beds to basket composts to plant teas – is associated with precise measurements. I found that some farmers immediately embraced the measurements as evidence of the demonstrated success of organic agriculture techniques. For example, I observed a group of workshop participants meticulously place 120 *sukuma wiki* (collard) plants on a double dug bed because they had been taught that 120 plants fit in one bed if one uses proper spacing. For other farmers, particularly women, knowledge of the entirety of organic agriculture measurements was a source of empowerment and indicator of expertise. However, I also discovered that many individuals felt intimidated and overwhelmed by the number of measurements that they were expected to remember in order to implement various organic farming techniques.

## Conclusion

This paper addressed the following question: how did socially and geographically disparate social worlds (e.g., NGOs, foreign donors, agricultural researchers, self-help groups, and individual farmers) unite to “challenge” the environmentally destructive and inequitable GR regime through the promotion of organic agriculture among Kenyan smallholders? My analysis has shown that

widespread discontent in Kenya (and elsewhere) with the research orientation, technology dissemination practices, and social and environmental externalities of the GR regime created space for new institutional actors, new agricultural ideas, new research themes, and new agricultural information pathways. Offering organic agriculture as an environmentally, economically, and socially sustainable alternative to the GR technological package, indigenous NGOs stepped forward beginning in the mid-1980s to fill this institutional space. These NGOs have since played an instrumental role in the diffusion of organic agriculture information throughout Kenya.

Despite their criticism (or “deconstruction”) of the GR regime, organic agriculture NGOs have not operated in isolation from the institutions that were so central during the GR era – i.e., donor organizations, agroscientific research institutes, universities, and public agricultural extension providers. Numerous linkages with these institutions (as well as with farming communities) suggest that organic agriculture NGOs play an important role as boundary organizations. Through the presentation of several examples, I have shown that organic agriculture NGOs in Kenya negotiate the boundaries between multiple social worlds, knowledge domains, and geographic scales. On one hand, they seek to build productive bridges between domains through the creation and use of boundary objects and hybrid forms that facilitate cross-world cohesion. On the other hand, they strategically manipulate the boundary between formal agricultural science and organic agriculture. Specifically, they expand the purview of agricultural science by scientizing various aspects of organic agriculture research and practice. Scientization enhances the legitimacy and authority of organic agriculture in the eyes of donors, potential research collaborators, the Kenyan state, and farmers.

Organic agriculture NGOs in Kenya have met with “success” on many fronts: the bridging of multiple social worlds and knowledge domains, the integration of scientific and localized knowledge, the scientization of organic agriculture, the securing of donor support, and the establishment of productive linkages with agroscientific institutions. However, given that NGOs seek to affect change “on the ground,” ultimate success rests with Kenyan farmers – their adoption and sustained use of organic agriculture practices. Elsewhere I analyze organic agriculture adoption data as well as farmers’ perceptions of the training and extension services provided by organic agriculture NGOs (Goldberger, forthcoming). Based on extensive fieldwork in eastern Kenya, I found that farmers expressed some frustration with the organic agriculture workshops and on-farm services provided by local NGOs. Organizational, cultural, and financial factors – such as rushed trainings, language barriers, lack of on-farm follow-up, and competing

organic and conventional agricultural messages – were negatively affecting organic farming adoption and, consequently, the success of organic agriculture NGOs in eastern Kenya. Nonetheless, a growing number of farmers across the country are embracing organic agriculture techniques, suggesting that the Kenyan case could be a model for other Southern countries seeking sustainable alternatives to the GR regime.

### Acknowledgments

The support for this research was provided by a US Department of Education Title VI Foreign Language and Area Studies Fellowship and funds from the Department of Rural Sociology, the Graduate School, and the Graduate Student Council at the University of Wisconsin–Madison. I am grateful to the late Frederick Buttel for his outstanding guidance during all stages of the research presented herein. I would also like to thank the four anonymous reviewers for their valuable comments.

### Notes

1. The proliferation of NGOs in Kenya has not taken place without controversy. During the late 1980s and early 1990s, fiery confrontations between some of the country's larger NGOs and the Kenyan government led to the enactment of the 1990 NGO Coordination Act which requires registration and close monitoring of national, regional, and international NGOs by a central NGO Bureau accountable to the Office of the President (Ndegwa, 1994). Widespread opposition by NGOs and the international donor community to the newly established “controlling” rather than “facilitatory” regulatory framework forced the government to amend the NGO legislation in 1992 (Ndegwa, 1994: 26; also see Kameri-Mbote, 2000). Despite the amended legislation, members of the NGO community remain displeased with the government's continued close scrutiny of registered NGOs, threats of deregistration, and reluctance to address corruption, among other complaints (Kameri-Mbote, 2000). The government has responded by accusing Kenyan NGOs of “political sabotage, corruption, and lack of transparency” (Ohayo, 1999).
2. The recognition of “indigenous” (or “local”) knowledge systems by development practitioners and scholars also contributed to opening up space for alternative agricultural practices (see, e.g., Brokensha et al., 1980; Chambers et al., 1989; Kloppenburg, 1991; Scoones and Thompson, 1994).
3. A fascinating example of *both* bridge building (or hybridization) and scientization involves beekeeping in Kenya (Goldberger, 2005). On one hand, beekeeping – as promoted by the government, development agencies, and

NGOs for the past three decades – incorporates both “traditional” and “modern” elements. Thus, it can be considered a hybrid form. On the other hand, the trend among NGOs is toward further modernization, commercialization, and standardization of beekeeping – an example of scientization or strategic boundary-work.

### References

- ABLH (Association for Better Land Husbandry) (1999). *Organic Certification Scheme*. Pamphlet, Nairobi, Kenya: ABLH.
- Altieri, M. A. and M. K. Anderson (1986). “An ecological basis for the development of alternative agricultural systems for small farmers in the Third World.” *American Journal of Alternative Agriculture* 1: 30–38.
- Asiema, J (1994). “Africa's Green Revolution.” *Biotechnology and Development Monitor* 19: 17–18.
- Balmer, B (1996). “The political cartography of the Human Genome Project.” *Perspectives on Science* 4(3): 249–282.
- Barrett, H. R., A. W. Browne, P. J. C. Harris, and K. Cadoret (2002). “Organic certification and the UK market: organic imports from developing countries.” *Food Policy* 27(4): 301–318.
- Bebbington, A. and J. Farrington (1992). “NGO-government interaction in agricultural technology development.” In M. Edwards and D. Hulme (eds.), *Making a Difference: NGOs and Development in a Changing World* (pp. 49–59). London, UK: Earthscan.
- Bebbington, A. and J. Farrington (1993). “Governments, NGOs and agricultural development: perspectives on changing inter-organisational relationships.” *Journal of Development Studies* 29(2): 199–219.
- Bowker, G. C. and S. L. Star (1999). *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: MIT Press.
- Bratton, M. (1990). “Non-governmental organizations in Africa: can they influence public policy?.” *Development and Change* 21: 87–118.
- Brokensha, D., D. M. Warren and O. Werner (1980). *Indigenous Knowledge Systems and Development*. Lanham, MD: University Press of America.
- Bruinsma, J. (2003). *World Agriculture: Towards 2015/2030: An FAO Perspective*. London, UK: Earthscan.
- Bud, R. (1991). “Biotechnology in the twentieth century.” *Social Studies of Science* 21(3): 415–457.
- Carey, H. F. and O. P. Richmond (2003). *Mitigating Conflict: The Role of NGOs*. London, UK: F. Cass.
- Cash, D. W. (2001). “In order to aid in diffusing useful and practical information: agricultural extension and boundary organizations.” *Science, Technology, and Human Values* 26(4): 431–453.
- Cash, D. W. and S. Moser (2000). “Linking global and local scales: designing dynamic assessment and management processes.” *Global Environmental Change* 10(2): 109–120.
- Chambers, R., A. Pacey and L. A. Thrupp (1989). *Farmer First: Farmer Innovation and Agricultural Research*. London, UK: Intermediate Technology Publications.



- Chaplowe, S. and J. P. Madden (1996). *The Emerging Role of NGOs in African Sustainable Development*. Glendale, CA: OM Publishing Consultants.
- Crucefix, D. (1998). *Organic Agriculture and Sustainable Rural Livelihoods in Developing Countries*. Bristol, UK: Soil Association.
- De Jager, A., D. D. Onduru, M. S. van Wijk, J. Vlaming, and G. N. Gachini (2001). “Assessing sustainability of low-external-input farm management systems with the nutrient monitoring approach: a case study in Kenya.” *Agricultural Systems* 69: 99–118.
- Diop, J., E. van der Werf, D. D. Onduru, and J. Kariuki (1998). *On-Farm Agro-Economic Comparison of Organic and Conventional Techniques in High and Medium Potential Areas of Kenya*. Leusden, Netherlands and Nairobi, Kenya: ETC Netherlands and Kenya Institute of Organic Farming (KIOF).
- Donisthorpe, J. and J. W. Njoroge (1993). *Farming for Health: Why Organic Farming is Good for the Land, the Crops, the Animals and the People Who Depend on Them*. Nairobi, Kenya: Kenya Institute of Organic Farming (KIOF).
- Edwards, M. and A. Fowler (2002). “Introduction: changing challenges for NGDO management.” In M. Edwards and A. Fowler (eds.), *The Earthscan Reader on NGO Management* (pp. 1–10). London, UK: Earthscan.
- Edwards, M., and D. Hulme (1996). *Beyond the Magic Bullet: NGO Performance and Accountability in the Post-Cold War World*. West Hartford, CT: Kumarian Press.
- EPOPA (Export Promotion of Organic Products from Africa) (2004). Summary report on the East African organic standards and certification workshop, Arusha, Tanzania, December 1–3, 2003. Retrieved from <http://www.grolink.se/epopa/Events/Archive/Summary%20Report%20EAW.pdf> on November 15, 2004.
- FAO (Food, Agriculture Organization of the United Nations) (1999). *Organic Agriculture. COAG/99/9*. Rome: FAO.
- Farrington, J., A. Bebbington, K. Wellard, and D. J. Lewis (1993). *Reluctant Partners? Non-governmental Organizations, the State and Sustainable Agricultural Development*. London, UK: Routledge.
- Fisher, D. (1990). “Boundary work and science: the relation between power and knowledge.” In S. Cozzens and T. Gieryn (eds.), *Theories of Science in Society* (pp. 98–119). Bloomington, IN: Indiana University Press.
- Fogel, C. (2002). “Globalization and the production of knowledge for policy: the case of biotic carbon sequestration and the Kyoto Protocol.” Paper presented at the 43rd Annual Convention of the International Studies Association, March 24–27, New Orleans, LA.
- FORMAT (Forum for Organic Resource Management and Agricultural Technologies) (2005a). “Origins and purpose of FORMAT.” Retrieved from [http://www.formatkenya.org/files/origins\\_and\\_purpose\\_of\\_format.htm](http://www.formatkenya.org/files/origins_and_purpose_of_format.htm) on September 29, 2006.
- FORMAT (Forum for Organic Resource Management and Agricultural Technologies) (2005b). “FORMAT technical report number 5.” Retrieved from <http://www.formatkenya.org/report2004/format2004/events.htm> on September 29, 2006.
- Fowler, A. (1991). “The role of NGOs in changing state-society relations: perspectives from eastern and southern Africa.” *Development Policy Review* 9(1): 53–84.
- Fowler, A. (1997). *Striking a Balance: A Guide to Enhancing the Effectiveness of Non-governmental Organizations in International Development*. London, UK: Earthscan.
- Francis, C. A., R. R. Harwood, and J. F. Parr (1986). “The potential for regenerative agriculture in the developing world.” *American Journal of Alternative Agriculture* 1: 65–74.
- Frost, L., M. R. Reich, and T. Fujisaki (2002). “A partnership for Ivermectin Social worlds, boundary objects.” In M. R. Reich (ed.), *Public-Private Partnerships for Public Health. Harvard Series on Population and International Health* (pp. 87–113). Cambridge, MA: Harvard Center for Population and Development Studies.
- Fujimura, J. H. (1992). “Crafting science: standardized packages, boundary objects, and ‘translation.’” In A. Pickering (ed.), *Science as Practice and Culture* (pp. 168–211). Chicago, IL: University of Chicago Press.
- Gachimbi, L. N., A. de Jager, H. van Keulen, E. G. Thurairara, and S. M. Nandwa, (2002). *Participatory Diagnosis of Soil Nutrient Depletion in Semi-Arid Areas of Kenya*. London, UK: IIED-Drylands Programme, Managing Africa’s Soils No. 26.
- Gaziano, E. (1996). “Ecological metaphors as scientific boundary work: innovation and authority in interwar sociology and biology.” *American Journal of Sociology* 101(4): 874–907.
- Gieryn, T. F. (1983). “Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists.” *American Sociological Review* 48: 781–795.
- Gieryn, T. F. (1995). “Boundaries of science.” In S. Jasanoff, et al. (eds.), *Handbook of Science and Technology Studies* (pp. 393–443). Thousand Oaks, CA: Sage.
- Gieryn, T. F. (1999). *Cultural Boundaries of Science: Credibility of the Line*. Chicago, IL: University of Chicago Press.
- Goldberger, J. R. (2005). *Farming on the Boundary: Organic Agriculture in Semi-Arid Kenya*. Ph.D. Dissertation. University of Wisconsin-Madison.
- Goldberger, J. R. (forthcoming). Diffusion and adoption of non-certified organic agriculture: a case study from semi-arid Makueni District, Kenya. *Journal of Sustainable Agriculture*.
- Guston, D. H. (1999). “Stabilizing the boundary between US politics and science: the role of the office of technology transfer as a boundary organization.” *Social Studies of Science* 29(1): 87–111.
- Guston, D. H. (2000). *Between Politics and Science: Assuring the Integrity and Productivity of Research*. Cambridge, UK: Cambridge University Press.
- Guston, D. H. (2001). “Boundary organizations in environmental policy and science: an introduction.” *Science, Technology, and Human Values* 26(4): 399–408.
- Halberg, N., H. F. Alroe, M. T. Knudsen, and E. S. Kristensen (2006). *Global Development of Organic Agriculture: Challenges and Prospects*. Wallingford, UK: CABI Publishing.
- Harvey, F. and N. Chrisman (1998). “Boundary objects and the social construction of GIS technology.” *Environment and Planning A* 30(9): 1683–1694.
- Henderson, K. (1991). “Flexible sketches and inflexible data bases: visual communication, conscription devices, and

- boundary objects in design engineering." *Science, Technology, and Human Values* 16(4): 448–473.
- Hulme, D. and M. Edwards (1997). *NGOs, States and Donors: Too Close for Comfort?*. New York, NY: St. Martin's Press.
- IFOAM (International Federation of Organic Agriculture Movements) (2005). Organic directory online. Retrieved from [http://www.ifoam.org/organic\\_world/directory/index.html](http://www.ifoam.org/organic_world/directory/index.html) on September 29, 2006.
- Igoe, J. (2003). "Scaling up civil society: donor money, NGOs and the pastoralist land rights movement in Tanzania." *Development and Change* 34(5): 836–885.
- IIRR (International Institute of Rural Reconstruction) (1998). *Sustainable Agriculture Extension Manual for Eastern and Southern Africa*. Nairobi, Kenya: IIRR.
- Jasanoff, S. (1997). "NGOs and the environment: from knowledge to action." *Third World Quarterly* 18(3): 579–594.
- Kaltoft, P. (2001). "Organic farming in late modernity: at the frontier of modernity or opposing modernity?." *Sociologia Ruralis* 41(1): 146–158.
- Kameri-Mbote, P. (2000). *The Operational Environment and Constraints for NGOs in Kenya: Strategies for Good Policy and Practice*. Geneva, Switzerland: International Environmental Law Research Centre Working Paper No. 2000–2002.
- Kanyinga, K. (1995). "The politics of development space in Kenya." In J. Semboja and O. Therkildsen (eds.), *Service Provision under Stress in East Africa: The State, NGOs and People's Organizations in Kenya, Tanzania and Uganda* (pp. 70–86). Copenhagen: Centre for Development Research.
- KARI (Kenya Agricultural Research Institute) (1997). *Harambee: Pulling Together for Kenya: The Kenya Agricultural Research Institute Strengthens Kenya's Economy and Food Security*. Nairobi, Kenya: KARI.
- Keengwe, M., F. Percy, O. Mageka, and M. S. Adan (1998). *NGO Roles and Relationships: Partnership Dilemmas for International and Local NGOs (in Kenya)*. London: International Institute for Environment and Development (IIED) NGO File Essay Series No. 3.
- Kelly, S. E. (2003). "Public bioethics and publics: consensus, boundaries, and participation in biomedical science policy." *Science, Technology, and Human Values* 28(3): 339–364.
- Kihia, J. K. and J. W. Njoroge (1995). *A Resource Guide of Organizations Promoting Organic Farming in East Africa Region*. Nairobi, Kenya: Kenya Institute of Organic Farming (KIOF).
- Kinchy, A. J. and D. L. Kleinman (2003). "Organizing credibility: discursive and organizational orthodoxy on the borders of ecology and politics." *Social Studies of Science* 33(6): 869–896.
- KIOF (Kenya Institute of Organic Farming) (nd). "Working toward organic farming standards for KIOF-trained organic farmers." Pamphlet. Nairobi, Kenya: KIOF.
- Kloppenborg, J. (1991). "Social theory and the de/reconstruction of agricultural science: local knowledge for an alternative agriculture." *Rural Sociology* 56(4): 519–548.
- Lamont, M. and V. Molnár (2002). "The study of boundaries in the social sciences." *Annual Review of Sociology* 28: 167–195.
- Latour, B. (1987). *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.
- Makoba, J. W. (2002). "Nongovernmental organizations (NGOs) and Third World development: an alternative approach to development." *Journal of Third World Studies* 19(1): 53–63.
- Markowitz, L. (2001). "Finding the field: notes on the ethnography of NGOs." *Human Organization* 60(1): 40–46.
- Martens, K. (2002). "Mission impossible? Defining nongovernmental organizations." *Voluntas: International Journal of Voluntary and Nonprofit Organizations* 13(3): 271–285.
- Mellor, F. (2003). "Between fact and fiction: demarcating science from non-science in popular physics books." *Social Studies of Science* 33(4): 509–538.
- Mihindo, N. (1997). "Organic agriculture in Kenya: fusion of science and traditional knowledge." In L. Guarino (ed.), *Traditional African Vegetables: Promoting the Conservation and Use of Underutilized and Neglected Crops* (pp. 96–97). Rome, Italy: International Plant Genetic Resources Institute.
- Miller, C. (2001). "Hybrid management: boundary organizations, science policy, and environmental governance in the climate regime." *Science, Technology, and Human Values* 26(4): 478–500.
- Moore, K. (1996). "Organizing integrity: American science and the creation of public interest organizations, 1955–1975." *American Journal of Sociology* 101(6): 1592–1627.
- Mukhwana, E. J. (n.d.). *The Role of NGOs and Farmer Associations in Innovative Organic Resource Management in Kenya*. Bungoma, Kenya: Sustainable Agriculture Centre for Research and Development in Africa (SACRED-Africa) Report.
- Nandwa, S. M., D. D. Onduru, and L. N. Gachimbi (2000). "Soil fertility regeneration in Kenya." In T. Hillhorst and F. Muchena (eds.), *Nutrients on the Move: Soil Fertility Dynamics in African Farming Systems* (pp. 119–132). London, UK: International Institute for Environment and Development (IIED).
- Ndegwa, S. N. (1994). "Civil society and political change in Africa: the Case of non-governmental organizations in Kenya." *International Journal of Comparative Sociology* 35(1/2): 19–36.
- Nigh, R. (1997). "Organic agriculture and globalization: a Maya associative corporation in Chiapas, Mexico." *Human Organization* 56(4): 427–436.
- Njoroge, J. W. (1994). *Field Notes on Organic Farming*. Nairobi, Kenya: Kenya Institute of Organic Farming (KIOF).
- Njoroge, J. W. (2001). Organic farming in Kenya. Retrieved from [http://www.ro.unctad.org/trade\\_env/test1/meetings/brussels/ORGANIC%20FARMING%20IN%20KENYA.doc](http://www.ro.unctad.org/trade_env/test1/meetings/brussels/ORGANIC%20FARMING%20IN%20KENYA.doc) on October 10, 2004.
- Njoroge, J. W. and C. Manu (1999). *Organic Farming: A Textbook for Post-Secondary Education*. Nairobi, Kenya: Kenya Institute of Organic Farming (KIOF).
- Ohayo, J. (1999). "They drive pajeros, They alleviate poverty: Yet no one loves NGOs." *The East African*, April 3–8.
- Omara, M. N., and P. L. Woome (2002). "Innovation in organic resource management: experiences from Kenya's forum for organic resource management and agricultural technologies." *Outlook on Agriculture* 31(4): 235–242.
- Onduru, D. D., G. N. Gachini, A. de Jager, and J. Diop (1999). *Participatory Research on Compost and Liquid Manure in*

- Kenya. London, UK: IIED-Drylands Programme, Managing Africa's Soils No. 8.
- Onduru, D. D., G. N. Gachini, and S. M. Nandwa (1998). *Experiences in Participatory Diagnosis of Soil Nutrient Management in Kenya*. London, UK: IIED-Drylands Programme, Managing Africa's Soils No. 3.
- Onduru, D. D., A. de Jager, G. Gachini, and J. Diop (2001). *Exploring New Pathways for Innovative Soil Fertility Management in Kenya*. London, UK: IIED-Drylands Programme, Managing Africa's Soils No. 25.
- Onduru, D. D., J. Diop, E. van der Werf, and A. De Jager (2002). "Participatory on-farm comparative assessment of organic and conventional farmers' practices in Kenya." *Biological Agriculture and Horticulture* 19(4): 295–314.
- Onduru, D. D., A. de Jager, and G. Gachini (2006). "The hidden costs of soil mining to agricultural sustainability in developing countries: a case study of Machakos district, eastern Kenya." *International Journal of Agricultural Sustainability* 3: 167–176.
- Osodo, P. and P. Matsvai (1998). *Partners or contractors? The Relationship Between Official Agencies and NGOs: Kenya and Tanzania*. Oxford, UK: International NGO Training and Research Center, Occasional Paper Series No. 16.
- Padel, S. (2001). "Conversion to organic farming: a typical example of the diffusion of an innovation?." *Sociologia Ruralis* 41(1): 40–61.
- Parrott, N. and T. Marsden (2002). *The Real Green Revolution: Organic and Agroecological Farming in the South*. London, UK: Greenpeace Environmental Trust.
- Parrott, N. and B. van Elzakker (2003). *Organic and Like-Minded Movements in Africa: Development and Status*. Bonn, Germany: International Federation of Organic Agriculture Movements (IFOAM).
- Parrott, N., C. Ssekyewa, C. Makuinike, and S. M. Ntambi (2006). "Organic farming in Africa." In H. Willer and M. Youssefi (eds.), *The World of Organic Agriculture: Statistics and Emerging Trends 2006* (pp. 96–107). Bonn, Germany: International Federation of Organic Agriculture Movements.
- Raynolds, L. T. (2000). "Re-embedding global agriculture: the international organic and fair trade movements." *Agriculture and Human Values* 17(3): 297–309.
- Raynolds, L. T. (2004). "The globalization of organic agro-food networks." *World Development* 32(5): 725–743.
- Rees, D., M. Momanyi, J. Wekundah, F. Ndungu, J. Odondi, A. O. Oyure, D. Andima, M. Kaman, J. Ndudi, F. Musembi, L. Mwaura, and R. Joldersma (2000). *Agricultural Knowledge and Information Systems in Kenya: Implications for Technology Dissemination and Development*. London, UK: Overseas Development Institute, Agricultural Research and Extension Network (AGREN) Paper No. 107.
- Scialabba, N. (2000). Factors influencing organic agriculture policies with a focus on developing countries. IFOAM 2000 Scientific Conference, August 28–31, Basel, Switzerland.
- Scialabba, N. and C. Hattam (eds.) (2002). *Organic Agriculture, Environment and Food Security*. Rome, Italy: Food and Agriculture Organization of the United Nations, Environment and Natural Resources Series No. 4.
- Scoones, I. and J. Thompson (1994). *Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice*. London, UK: Intermediate Technology Publications.
- Shrum, W. (2000). "Science and story in development: the emergence of non-governmental organizations in agricultural research." *Social Studies of Science* 30(1): 95–124.
- Smillie, I. (1997). "NGOs and development assistance: a change in mind-set?." *Third World Quarterly* 18(3): 563–577.
- Star, S. L. (1989). "The structure of ill-structured solutions: boundary objects and heterogeneous distributed problem solving." In L. Gasser and M. N. Huhns (eds.), *Distributed Artificial Intelligence* (pp. 37–54). London, UK: Pitman.
- Star, S. L. and J. R. Griesemer (1989). "Institutional ecology, 'translations,' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39." *Social Studies of Science* 19: 387–420.
- Thomas-Slayter, B. P. (1992). "Implementing effective local management of natural resources: New roles for NGOs in Africa." *Human Organization* 51(2): 136–143.
- Tibaldi, E. (1992). "Organic agriculture for sustainable development." *Development* 3: 77–80.
- Tovey, H. (1997). "Food, environmentalism, and rural Sociology: on the organic farming movement in Ireland." *Sociologia Ruralis* 37(1): 21–37.
- Van der Werf, E., J. Kariuki, and D. D. Onduru (1997). "Methodological issues in comparative agro-economic on-farm research assessments of organic versus conventional farming techniques." *Biological Agriculture and Horticulture* 14(1): 53–69.
- Vukasin, H. L., L. Roos, N. Spicer, and M. Davies (1995). *Production Without Destruction: A Manual for Trainers and a Reference Book for Those Practicing Natural or Organic Farming*. Harare, Zimbabwe: Natural Farming Network.
- Wellard, K. and J. G. Copestake (1993). *Non-governmental Organizations and the State in Africa: Rethinking Roles in Sustainable Agricultural Development*. London, UK: Routledge.
- Willer, H. and M. Youssefi (2006). *The World of Organic Agriculture: Statistics and Emerging Trends 2006*. Bonn, Germany: International Federation of Organic Agriculture Movements.
- WRI (World Resources Institute) (2003). "Awakening civil society." In: *World Resources 2002–2004: Decisions for the Earth: Balance, Voice, and Power* (pp. 65–88). Washington, DC: WRI.

*Address for correspondence:* Jessica R. Goldberger, Department of Community and Rural Sociology, Washington State University, P.O. Box 644006, Pullman, WA 99164-4006, USA  
Phone: +1-509-3358540; Fax: +1-509-3352125;  
E-mail: jgoldberger@wsu.edu