**Enhancing socio-ecological value creation through**

**Sustainable Innovation 2.0:**

**Moving away from maximizing financial value capture[[1]](#footnote-1)**

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**Abstract**

*There is considerable consensus that a key to addressing the serious socio-ecological crises facing the world is for organizations to implement innovations that foster sustainable development. Drawing from the sustainability, innovation, and Resource Based View literatures, this paper aims to examine the organizational capabilities associated with promoting a particular sustainable innovation—Conservation Agriculture—among small-scale farmers in low-income countries. Findings suggest that a paradigm shift is needed to what we call Sustainable Innovation 2.0. Sustainable Innovation 2.0 is associated with a double bottom line approach to sustainability that seeks to enhance positive socio-ecological externalities while maintaining financially viable organizations (i.e., financial well-being is subservient to socio-ecological well-being). We describe how Sustainable Innovation 2.0 is associated with: i) making rare sustainable innovations commonplace; ii) making inimitable emerging sustainable innovations transferable; and iii) developing institutional infrastructures and bundles of resources that counteract the non-substitutability of sustainable innovations. We discuss the implications of these ideas for the associated literatures and for future research.*

**Keywords:** Sustainable innovation, sustainable development, radical RBV, natural RBV, double bottom line, low-income countries

**1 - Introduction**

 The world is becoming increasingly aware of the social and ecological crises it is facing, and of the need for more sustainable ways of living. For an example of a social crisis, consider how economic inequality continues to grow within organizations, within countries, and between countries (e.g., Rees, 2002; Dabla-Norris et al., 2015). This inequality is associated with a lower overall quality of life, reduced social trust and social mobility, and increased rates of anxiety and crime (e.g., Wilkinson & Pickett, 2010). For an example of an ecological crisis, consider the on-going emission of greenhouse gases that contribute to climate change (e.g., Intergovernmental Panel on Climate Change, 2014), or that up to two-thirds of the earth’s land has been degraded, often due to modern industrial agricultural practices (Bot et al., 2000). Today scholars are suggesting that we have entered the Anthropocene era where humankind is having such an impact on the Earth that it threatens our survival as a species (e.g., Zalasiewicz et al., 2010).

 There is also increasing awareness that business plays a key role in contributing to these crises. For example, the world’s 3000 largest corporations are estimated to annually create more than US$2 trillion in negative ecological externalities (Sukhdev, 2013), which amounts to about 7% of their revenues and 4% of global GDP. This averages out to about $300 per person on the planet, which is especially striking when we realize that one-third of the planet lives on less than $2/day (Poverty Overview, 2014). Today, the 85 richest people on the planet own as much wealth as the poorest *half* of the world (Fuentes-Nieva & Galasso, 2014), and the Walton family owns as much wealth as the poorest half of the U.S. population (Fitz, 2015). Business people are also becoming increasingly aware of social and ecological sustainability challenges, with two-thirds of respondents in a recent large international survey rating these challenges as “significant” or “very significant” for their firms (Kiron et al., 2013).

 These developments have created a great need for innovations that foster sustainable development, and in particular a need for innovations that address the negative socio-ecological externalities that are associated with the existing production processes of key organizations on this planet (Boons et al., 2013; Silvestre, 2015a). In response, this paper aims to examine the organizational capabilities associated with promoting a particular sustainable innovation—Conservation Agriculture—among small-scale farmers in low-income countries. Conservation Agriculture (CA) is a particularly important sustainable innovation because it is relevant for the most common type of organization on the planet, namely 500 million small-scale farms (less than 5 acres or 2 hectares in size). These farms involve 2.7 billion people (i.e., about 35 percent of the world’s population), encompass up to 60 percent of the planet’s arable land, and produce nearly 70 percent of food consumed (Locke, 2015). CA has the potential to double productivity on these small-scale farms, while removing carbon from the atmosphere, restoring it to the soil, and enhancing the social well-being of farmers and their families and communities.[[2]](#footnote-2) Thus, CA is a sustainable innovation that has the potential to become a key driver for a more sustainable world.

 In particular, findings suggest that there are two key approaches to sustainable innovation, which we compare and contrast. We call the first approach Sustainable Innovation 1.0 (henceforth SI 1.0), which is the most common type in the sustainable development literature. SI 1.0 refers to sustainable innovations adopted by organizations that are motivated by the financial returns that such innovations generate. The ultimate goal in SI 1.0 is to enhance their financial interests via reducing an organization’s negative socio-ecological externalities. SI 1.0 is consistent with research in the Natural Resource Based View (Hart, 1995; Hart & Dowell, 2011), the Base of the Pyramid (e.g., Hart, 2007; Prahalad, 2010), and approaches like the triple bottom line (Elkington, 1997), which value sustainable innovations that simultaneously improve profits, people, and the planet.

 The second type, which we call Sustainable Innovation 2.0 (SI 2.0), is the one we will focus on in our study. SI 2.0 refers to sustainable innovations adopted by organizations that are motivated by the social and ecological returns that such innovations generate (i.e., the ultimate goal is to improve overall social and ecological well-being). This type of innovations enable organizations to enhance positive socio-ecological externalities while remaining financially viable (i.e., not needing to *maximize* financial returns). This does not mean the financial dimension is unimportant, but that it is less important than the other two dimensions. SI 2.0 is consistent with the Radical Resource Based View (Bell & Dyck, 2011; Walske et al., 2013) and what might be called a double bottom line approach, where enhancing social and ecological well-being is considered to be more important than enhancing financial well-being (see also Kurucz et al., 2014).

The paper proceeds as follows. First, we review the literature associated with SI 1.0 which we use as a springboard to develop SI 2.0 theory, and then we introduce four propositions that guide our empirical study. Second, we present our methodology, which features qualitative field data identifying organizational capabilities of exemplary non-governmental organizations (NGOs) that promote a particular sustainable innovation (i.e., Conservation Agriculture) among small-scale farms in low-income countries. Third, we present our analyses and findings, which provide an empirical examination of the kinds of organizational capabilities associated with SI 2.0 and the double bottom line approach. We conclude with a discussion of how our study contributes to the literature, and identify the implications for future research in innovation for sustainable development.

**2 - Sustainable Innovation and the Resource-Based View (RBV)**

***2.1 - Sustainable Innovation 1.0 and Natural RBV***

 Although there is some debate in the larger literature as to what constitutes a sustainable innovation, there is general agreement that both organizational and technological innovations are a primary and necessary means for improving sustainability (Boons et al., 2013; Klewitz & Hansen, 2014; Silvestre & Silva Neto, 2014a). Sometimes sustainable innovation is defined rather narrowly to refer to innovations that integrate environmental objectives (Castiaux, 2012), and seen as synonymous with “environmental innovation,” “ecological innovation,” or “green innovation” (Karakaya et al. 2014; Schiederig et al., 2012). However, many scholars have developed a more comprehensive definition of sustainable innovation. For example, Bos-Brouwers (2010) defines sustainable innovations as those that not only deliver improved financial performance, but also enhance environmental and social performance. The literature around this broader definition of sustainable innovation has been growing substantially (Hall et al., 2012a; Boons & Ludeke-Freund, 2013; Rosca et al., 2016) and has become dominant (Quist & Tukker, 2013; Silvestre, 2015b).

This broader definition is consistent with the mainstream understanding of sustainable development that draws from the Brundtland Report (1987, p. 8), which defines it as [economic] “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Commentators have noted that this definition has been crafted to be consistent with dominant capitalist economic business thinking, resulting in it being more conservative than it could be (e.g., Castro, 2004). For example, the Brundtland definition places greater emphasis on reducing negative socio-ecological externalities (i.e., minimizing a compromised future) than on enhancing positive externalities (e.g., optimizing a flourishing future). In any case, descriptions of sustainable innovations consistent with SI 1.0 emphasize the economic dimension of sustainable development, and are often content to simply reduce negative socio-ecological externalities.

 This three dimensional understanding of sustainable development and innovation—encompassing financial, social, and ecological well-being—is evident even in the most popularized expression of this approach, the so-called triple bottom line approach (Elkington, 1997), which posits that sustainable innovations balance the three dimensions of performance (i.e., financial, social, and ecological), but where financial well-being is generally treated as “the first among equals.” For example, even though the vast majority of leading Fortune 500 firms provide annual reports that include multiple aspects of the triple bottom line (Glavas & Mish, 2015), evidence suggest that in practice the financial bottom line is almost always prioritized by businesses (Ramus & Montiel, 2005; Delams & Burbano, 2011).

 This emphasis on the financial bottom line is consistent with Natural RBV (Hart, 1995; Hart & Dowell, 2011), which has served as a particularly influential theoretical framework underlying research in sustainable development and innovation. Natural RBV builds and expands upon ideas in Conventional RBV (Barney, 1991), which has arguably become the dominant theory in conventional strategy and has a focus on maximizing firms’ financial value capture (Barney et al., 2001, p. 625; Darnall, 2006). In particular, central to both Conventional and Natural RBV is the idea that organizations should seek to achieve competitive advantage that is sustainable in the long-run. The way to achieve this is to identify particular organizational knowledge and physical “resources” (also called “capabilities”) that, on their own or bundled together, have four characteristics: they are valuable, rare, inimitable, and non-substitutable (VRIN). Regarding resources and capabilities related to innovations, RBV suggests that the most valuable innovations are those which (a) enable a firm to appropriate their financial benefits and thus maximize profits (value), (b) provide the firm with a unique advantage over competitors (rare), (c) are difficult for competitors to copy (inimitable), and (d) are difficult to replace with a different bundle of resources (non-substitutable).

The main difference between Conventional RBV and Natural RBV is that the former does not consider a firm’s socio-ecological externalities, whereas the latter does. From an SI 1.0 perspective, theory and practice consistent with conventional approaches to RBV and innovation that ignore socio-ecological-externalities have created both problems and opportunities. Problems include economic inequality (within organizations, within countries, and among countries) and climate change. Opportunities include missed chances for organizations to enhance their financial well-being while reducing negative ecological externalities (e.g., reducing product packaging helps to reduce costs, thus increasing financial well-being) and reducing negative social externalities (e.g., reducing stress in the workplace helps to reduce the costs associated with absenteeism, thus increasing productivity and financial well-being).

Natural RBV takes the basic framework of Conventional RBV, but adds an understanding of “sustainable development” and thereby makes an important contribution to SI 1.0. According to Hart (1995, p. 1002): “A sustainable-development strategy is fostered by a strong sense of social-environmental purpose, which provides the backdrop for the firm's corporate and competitive strategies.” Natural RBV suggests that an organization should foster sustainable innovations that enhance its competitive advantage and long-term profits by taking into account and addressing the organization’s negative socio-ecological externalities. For example, “a pollution-prevention strategy should facilitate lower costs, which, in turn, should result in enhanced cash flow and profitability for the firm” (Hart, 1995, p. 993).

Organizations that are managed according to the SI 1.0 and Natural RBV approach seek to develop sustainable innovations that optimize financial value capture by seizing opportunities to reduce costs that are associated with negative socio-ecological externalities (e.g., Hart & Dowell, 2011). This has led to the development of many truly laudable innovations that have helped to enhance profits while simultaneously reducing negative socio-ecological externalities (e.g., Shrivastava & Kennelly, 2013; Winn & Pogutz, 2013; Vachon & Mao, 2008; Park et al., 2010). However, because SI 1.0 is constrained by the need to develop innovations that enhance financial well-being, a result is that many other possible innovations to enhance socio-ecological well-being are overlooked. For example, Bill Gates (2007) notes that, because business can make more money pursuing other activities, millions of children die for lack of medicine costing one dollar.

 Finally, of some relevance for our study, RBV has also played an important role in informing the development of theory within the “Base of the Pyramid” discourse, which focuses on social value creation (e.g., Conner & Prahalad, 1996; Hart & Dowell, 2011). The premise of the Base of the Pyramid approach is for organizations to develop innovative products and services that can both enhance their own financial interests while improving the social well-being of some of the poorest people on the planet. However, critics of BOP argue that its emphasis on financial value capture may limit its ability to *optimally* enhance social and ecological well-being, and thus it fails the poor (e.g., Arora & Romjin, 2012, p. 487; Munir et al., 2010; Hall et al., 2012b). For example, it is unclear whether inviting the world’s poorest people to participate in the globalized formal economy is really in their interest, given globalization’s track record of widening the gap between rich and poor within organizations, within supply chains, within countries, and between countries (e.g., Rees, 2002; Hall et al., 2012b; Silvestre & Silva Neto, 2014b). One way to address these concerns is to use RBV to help poor people gain valuable resources that enable *them* to capture financial value in the global markets, such as by showing how the poor can generate income by patenting their knowledge and bringing it to market (Shivarajan & Srinivasan, 2013).

***2.2 - Sustainable Innovation 2.0 and Radical RBV***

 Despite the undisputed successes of SI 1.0, critics argue that in order to more fully and adequately address the socio-ecological challenges facing the planet, we need to develop approaches akin to SI 2.0 that go beyond the primary emphasis on financial well-being that characterizes SI 1.0. For example, there is something inherently bothersome when two-thirds of managers believe that their firms have largely or fully addressed issues related to social and ecological sustainability (Kiron et al., 2013), while at the same time business continues to cause $2 trillion in negative ecological externalities and income inequality continues to grow (Sukhdev 2013). Just as the development of SI 1.0 and Natural RBV was triggered by and responded to problems and opportunities within Conventional RBV and innovation theory, so also the development of SI 2.0 can be seen as a reaction to problems and opportunities associated with SI 1.0. These problems include the continued social and ecological issues already mentioned. The opportunity is to place greater emphasis on sustainable development as enhancing positive externalities, and to treat financial well-being as a subservient dimension to socio-ecological well-being (i.e., rather than treating financial well-being as first among equals).

Sustainable innovations consistent with an SI 2.0 approach can be much more holistic and have fewer financial constraints than with an SI 1.0 approach (e.g., Tregidga et al., 2015). From an SI 2.0 perspective, sustainable innovations primarily foster socio-ecological development that enhances the ability of present and future generations to meet their needs and to flourish, while maintaining an organization’s financial viability. There are two key differences between SI 1.0 and SI 2.0. First, SI 2.0 has a much broader understanding of “development,” and it explicitly distances itself from a primary focus on *economic* development. From an SI 2.0 perspective, sustainable development refers to nurturing and enhancing the well-being of people and the planet, which may also entail economic development. This draws attention to a second fundamental difference between SI 1.0 and 2.0: whereas SI 1.0 seeks not to “compromise” the ability of future generations to meet their needs, SI 2.0 seeks to *enhance* the socio-ecological well-being of both present and future generations. Rather than be content that sustainable innovations focus on reducing negative socio-ecological externalities in ways that enhance financial well-being (e.g., SI 1.0), SI 2.0 focuses on enhancing positive socio-ecological externalities in ways that are financially viable.

We believe it is helpful to think of SI 1.0 and SI 2.0 as two distinct Weberian “ideal-types.” Put in terms that are familiar to strategy researchers, both ideal-types seek to engage in socio-ecological “value creation” that goes beyond the firm (Santos, 2012; cf. “shared value” as described by Porter & Kramer, 2011, p. 64), and both agree that it is no longer sufficient to focus only on an organization’s financial “value capture.” But they differ in their relative emphasis on value creation versus value capture. SI 1.0 seeks an ostensibly balanced approach—consistent with the idea that by enhancing socio-ecological value creation, sustainable innovations can simultaneously enhance an organization’s financial value capture in line with the triple bottom line approach—whereas SI 2.0 prioritizes socio-ecological value creation over financial value capture.[[3]](#footnote-3)

Of course, in reality sustainable innovations can be found everywhere along a continuum between the two ideal-types. In particular, we note that it is possible for an innovation to create value for multiple stakeholders and simultaneously achieve above average financial returns (i.e., an innovation could follow the logic of SI 2.0 in terms of socio-ecological value creation, and at the same time allow an organization to achieve superior financial value capture). Even so, our articulation of these two Weberian ideal-types is useful for the purpose of theory building, and for practitioners who wish to understand where they lie along the continuum (and where they aspire to be). A *primary* emphasis on socio-ecological value creation (with a *secondary* emphasis on financial value capture) is what distinguishes SI 2.0 from SI 1.0. Thus, SI 2.0 presents an important contrast to the triple bottom line approach. Rather than depicting people-planet-profit as three “equal” bottom lines, SI 2.0 suggests that there are two primary bottom lines (people and planet), and a subservient third bottom line (profit).

As summarized in Table 1, SI 2.0 is consistent with what has been called Radical RBV theory, where socio-ecological value creation trumps financial value capture (e.g., Bell & Dyck, 2011; Walske et al., 2013; Santos, 2012; Shrivastava & Kennelly, 2013; Winn & Pogutz, 2013). In particular, SI 2.0 builds on the shoulders of Walske et al. (2013) who argue for a radical variation of RBV that seeks to enhance *overall* “value creation” by inviting and enabling other organizations in the sector to participate in and share the “value capture” associated with sustainable innovations. In their view, the impact of sustainable innovations that enhance socio-ecological value creation will be greater if they are cooperatively shared with, and emulated by, other organizations (Hoffman et al., 2012; Matos & Silvestre, 2013). “As such, instead of resources being rare, inimitable, and non-substitutable, [as per VRIN] the greatest social [and ecological] impact might be achieved if they are *valuable*, yet *common, transferrable* and *substitutable* (i.e., VCTS)” (Walske et al., 2013, p. 11, emphasis added here). The rationale and hallmarks of Radical RBV are developed most fully in Bell & Dyck (2011) whose argument suggests that, consistent with SI 2.0, Radical RBV will be associated with sustainable innovations that deem profit-maximization (financial value capture) as less important than achieving a more holistic value creation that balances a comprehensive set of forms of well-being (including financial, social, ecological, spiritual, and physical) for all stakeholders (including owners, employees, customers, suppliers, competitors, neighbors, future generations, etc).

**-- insert Table 1 about here –**

In other words, from an SI 2.0 perspective, the value of a sustainable innovation is not rooted in its ability to enhance financial value capture for the host organization (which would benefit from the sustainable innovation remaining rare, inimitable, and non-substitutable). Rather, from an SI 2.0 perspective, the value of a sustainable innovation is rooted in its ability to enhance socio-ecological well-being (while allowing for a firm to be financially viable), which can be further enhanced if the innovation is shared with and adopted by many organizations. Instead of assuming that each organization seeks to *maximize* its financial interests (SI 1.0), SI 2.0 assumes that each organization determine what level of financial performance is “enough” or “satisfactory” for it to remain financially viable (Leshem, 2016). Taken together and consistent with Radical RBV, our review of the literature brings us to the following four propositions related to the VRIN/VCTS framework:

**Proposition 1:** In line with the SI 2.0 approach, sustainable innovations are recognized as *valuable* primarily because they enhance socio-ecological well-being while being financially viable (rather than primarily because they enhance financial well-being);

**Proposition 2:** The SI 2.0 approach is associated with organizational capabilities that make sustainable innovations *commonplace* (rather than keeping them *rare*);

**Proposition 3:** The SI 2.0 approach is associated with organizational capabilities that make sustainable innovations *transferrable* (rather than keeping them *inimitable*); and

**Proposition 4:** The SI 2.0 approach is associated with organizational capabilities that make sustainable innovations *substitutable* via the development of alternate bundles of resources and institutional infrastructure (rather than being kept *non-substitutable*).

**3 – Methods**

***3.1 – Case Selection***

As is appropriate for an exploratory study like this one, research sites were chosen where phenomena related to our propositions would be most transparently observable (e.g., Eisenhardt, 1989). In particular, we were interested in finding organizations promoting specific sustainable innovations that are known for seeking to improve primarily social and ecological well-being, and who placed greater emphasis on value creation rather than on financial value capture. Moreover, following Santos’s (2012) counsel, the organizations in our sample were working to address social and ecological problems that: i) have been neglected by others; ii) involve positive externalities (i.e., seek to enhance social and ecological outcomes); and iii) benefit a powerless segment of society. Our chosen sites are consistent with these criteria, as well as being of considerable practical importance for management and a deeper understanding of SI 2.0.

As mentioned earlier, the specific sustainable innovation we will examine is Conservation Agriculture (CA). CA represents a sustainable innovation that focuses on the production of food, and in particular the production of food on the 500 million small-scale farms on the planet. CA has three components, each of which help to improve the quality of soil:

1) *Minimize the mechanical disturbance of the soil.* CA promotes zero-tillage direct-seeding or planting techniques, which enhance the soil and may help to reduce the effect of global CO2 emissions by 5 to 15 percent (Gomiero et al., 2008, p. 248).[[4]](#footnote-4)

2) *Provide permanent organic cover for the soil by using mulch or crop residues or cover cropping.* In this way CA enhances the organic matter of soils, encourages the growth of helpful biological organisms, improves water infiltration, and reduces water needs by 25 to 30 percent (Joshi, 2011).

3) *Diversify and rotate the kinds of crops planted in the soil.* For example, after growing corn, which generally depletes nitrogen from the soil, farmers often plant nitrogen-fixing leguminous crops such as beans.

 We focus on CA as a sustainable innovation because past research has shown that introducing CA practices on small-scale farms enhances: 1) *social* well-being by improving the overall quality of life on small-scale farms (e.g.,Hurni & Osman-Elasha, 2009; Kiers et al., 2008; McIntyre et al., 2009; Milder et al., 2011; Stokstad, 2008); 2) *ecological* well-being by improving soil quality and fertility, partially by taking carbon from the atmosphere and sequestering it in the soil (e.g., Joshi, 2011; Stokstad, 2008)[[5]](#footnote-5); and 3) *economic* well-being by doubling productivity (e.g., Pretty et al., 2011), reducing poverty more effectively than other non-agricultural kinds of GDP growth (De Schutter, 2011, p. 14), greatly reducing financial input costs (e.g., fertilizers), and being easy to implement (i.e., “Everybody can do it” – Silici et al., 2011, p. 143).

Note that within the larger agricultural development literature, CA is more likely to be associated with the “multifunctional agriculture” paradigm (akin to SI 2.0) than the “industrial agriculture” paradigm (akin to SI 1.0). The industrial agriculture paradigm, exemplified by the Green Revolution, has focused successfully on innovations that maximize on-farm productivity (e.g., use of fertilizers). Unfortunately many of these innovations have subsequently been associated with negative ecological and social outcomes including deteriorating soil quality, water pollution, widening economic inequality, and the growth of urban slums (e.g., Dreyfus et al., 2009; Hurni & Osman-Elasha, 2009; Hall et al., 2011). For example, in terms of *ecological* problems, intense use of chemical inputs like fertilizers and pesticides decreases the quality of the soil, pollutes streams, and generates other negative externalities (Carolan, 2014). In terms of problematic *social* outcomes, the Green Revolution has been associated with decreasing food security for small-scale farmers and increasing social inequality (e.g., 80 percent of 324 studies show that applying the Green Revolution paradigm in low-income countries serves to widen the gap between rich and poor, Bientema & Koc, 2009, p. 525).

Finally, of particular relevance for the present study is the persistent theme in the CA literature that, despite its demonstrated benefits in terms of socio-ecological value creation, the challenge for getting CA implemented on small-scale farms is more *managerial* than it is *agronomic* in nature. Indeed, *many experts are calling on management scholars to weigh in* (e.g., De Schutter, 2010; Joshi, 2009, 2011; Lele & Trigo, 2010; Meyer, 2010; Pretty et al., 2011; Silici et al., 2011). In other words, dominant management theories that seek to promote CA via an SI 1.0 perspective have not been helpful; our exploratory study examine whether an SI 2.0 lens may be more relevant and insightful.

***3.2 - Data Collection***

We used a multi-step process to collect case study data related to the key organizational capabilities of NGOs considered to be exemplary in how they facilitate the implementation of CA-related innovations on small-scale farms in low-income countries.[[6]](#footnote-6) The data reported here are from two separate but related studies (Braul et al., 2011; Braul et al., 2010) funded by the Canadian Foodgrains Bank (CFGB), a charitable organization seeking to end hunger worldwide (see <http://www.foodgrainsbank.ca/>). Both studies were designed to collect data on best practices of community-based non-government organizations (NGOs) for facilitating the diffusion of CA-related innovations among small-scale farms.

The first study focused on six exemplary local non-government organizations (NGOs) in Africa, and the second on five exemplary NGOs in Central America. Each study involved site visits to these NGOs by a CFGB staff person and four staff representatives of North American member agencies that CFGB works with. The six African NGOs chosen (five in Mozambique, and one in Malawi) were based on recommendations by CFBG member agencies, and in most cases had previously received CFGB funding. Of the world’s estimated 1.02 billion chronically-malnourished people in 2009-10, an estimated 265 million lived in Sub-Saharan Africa (Pretty et al., 2011). GDP per capita is $145 in Malawi, and $300 in Mozambique, though the life expectancy in Malawi is 48 years versus 43 in Mozambique. About two-thirds of the population in Malawi and Mozambique lives in poverty (Ellis, 2005).

The NGOs selected for the Central America study were recommended by a consultant who had been hired by CFGB to visit five different countries in Central and South America and tasked with identifying exemplary organizations that work with small-scale farms in promoting CA-related innovations. The sample of five local NGOs for this study was drawn from Honduras, which was identified as hosting the most exemplary organizations in this region. None of the five local NGOs participating in the Honduras study had received CFGB funding. About two-thirds of Honduras’ 8 million people live below the poverty line, with about 40 percent living in extreme poverty (which included about half of the 4 million people living in rural areas). Over 80 percent of Honduran farms are less than 5 hectares (average 1.4 hectares), and top-soil loss has resulted in 40 percent of the land area to be deemed “degraded” (Braul et al., 2011).

Each site visit to each of the eleven local NGOs in the sample lasted one day. For each site the researchers asked questions about the successes and failures of the NGO, lessons learned, key innovations, and outcomes for small-scale farms. The NGOs were informed beforehand that the visits were to be opportunities to share information about the successful and challenging elements of their projects. Data gathering for each NGO in the sample included: 1) talking to leaders and staff of the NGO who provided a general overview of their programs, and 2) talking to local farmers during on-site visits to small-scale farms where the NGO’s projects were being implemented. The researchers took careful notes, and met together each evening after each site visit to distill their findings. A report was written for each local NGO site, and the final overall reports for the two studies contained a list of 17 “general recommendations” –the focal point of our study—that represented the key capabilities required to facilitate CA-related innovations on small-scale farms (ten key capabilities were listed in the Honduras report, and seven in the Malawi/Mozambique report). In total the two reports were about 17,000 words long (about 70 double-spaced pages).

***3.3 - Data Analysis***

The data were analyzed in two successive iterations. Both iterations examined each of the 17 key organizational capabilities presented in the final reports. In the language of RBV, the 17 findings represented the key “resources” or “capabilities” (we use these terms interchangeably) that CFGB had identified for facilitating CA-related innovations for small-scale farms in low-income countries. The first iteration of the data analysis (results described in subsection 4.1) involved examining the nature of why the 17 capabilities were deemed *valuable* (i.e., we examined the “V” in the VRIN/VCTS framework). In particular, we examined each capability for its perceived value in terms of fostering financial, social, and ecological well-being. This somewhat coarse-grained analysis enabled us to examine whether the 17 resources were more consistent with socio-ecological value creation (i.e., Radical RBV) or with financial value capture (i.e., Natural RBV). If the data were more consistent with Natural RBV (SI 1.0) than they were with Radical RBV (SI 2.0), then we would expect the value of resources to be described in terms of their link to achieving competitive advantages, profits, and financial benefits. However, as explained in Bell & Dyck (2011), if the data were more consistent with Radical RBV (SI 2.0), then we would expect the 17 resources to emphasize social and ecological benefits for the larger community.

In the second iteration of data analysis (results described in subsection 4.2), each of the 17 key capabilities was analyzed to determine whether it placed primary emphasis on the resource’s *rarity* (i.e., resources that are held by no/few other current or potential competitors) versus commonplaceness, *inimitability* (i.e., resources that are costly to develop or copy by other organizations) versus transferability, and its *non-substitutability* (i.e., resources that are not easily/affordably replaced by other bundles of resources/capabilities held by other current/potential competitors) versus substitutability.

**4 - Findings**

***4.1 – Socio-ecological value creation versus financial value capture***

Consistent with our propositions, the first iteration of data analysis suggested that the “value” of the 17 key organizational capabilities identified in the reports was more consistent with expectations of SI 2.0 (Radical RBV) than with SI 1.0 (Natural RBV). Virtually all of the 17 key organizational capabilities were deemed *valuable* primarily because they create value for the holistic (socio-ecological) well-being of small-scale farms and their local communities, not because they maximized *financial* value capture per se.

In general terms, this finding is illustrated by executing several word counts in the reports. For example, the reports include few of the “keywords” generally associated with SI 1.0 and Natural RBV:

* zero mentions of the terms “competitiveness,” “compete,” or “competition”;
* one mention of the term “financial” (provided by an agency to pay for a cement lid);
* three mentions of the terms “profit” or “profitable” or “profitability” (one mention of a non-profit organization, and two mentions that “The exclusion of herbicides and chemical fertilizer use was often cited as necessary to increase profit margins and reduce soil erosion”); and
* six mentions of the term “money” (one referring to savings from having a family garden, three referring to the need for small-scale farmers to work off-the-farm, and two referring to aid from external agencies, one of which “used the ‘passing on the gift’ wherever possible so that external inputs could be passed on to others”).

In contrast, consistent with SI 2.0 and Radical RBV, the two reports make over 75 mentions of the terms “community” or “communities.” Some of these references refer to a geographic location/place, and many refer to enhancing social cohesion and overall well-being within the community, building community capability, and generally strengthening the local community as a unit of analysis. These findings are entirely consistent with the VCTS framework (Walske et al., 2013), Radical RBV (Bell & Dyck, 2011), and the broader idea of value creation (Santos, 2012).

Consistent with these findings based on simple word counts, an in-depth content analysis of the 17 key resources revealed that there is almost no emphasis on achieving competitive advantage among farms or NGOs or community members (one possible exception may be the mention of developing programs targeted to young people, which may serve to provide them with a “competitive advantage” over other demographic groups). This is not to suggest that small-scale farmers are not interested in increasing their farm income—they are interested and the reports describe the merits of doing so (e.g., via cash crops and off-farm sales)—but there is never any hint that this is achieved by competing with neighboring farms or by achieving a sustainable competitive advantage. Instead, the emphasis is on collaborating with neighbors and other communities so that all may benefit from the holistic value creation associated with CA.

Finally, each of the 17 key capabilities were also analyzed to determine whether they placed primary emphasis on economic, social, or ecological well-being. These are shown in Tables 2, 3 and 4, and are described more fully in the next section. The results suggest that by far the greatest emphasis was placed on social well-being (which was the primary focus in 12 of the 17 resources, and a secondary consideration in the remaining 5). In other words, each of the 17 resources sought to improve the social well-being of small-scale farmers, typically by improving food security and creating healthier food and better soil. The second greatest emphasis was on enhancing ecological well-being (primary on 3 resources, secondary in 2 others). The emphasis on economic well-being was marginally lower (primary on 2 resources, evident in 3 others).

The overall relative emphasis on socio-ecological well-being, rather than a primary emphasis on economic well-being, is entirely consistent with SI 2.0. Two observations about the five references to economic well-being are noteworthy. First, each reference to economic well-being is from the category of “non-substitutable” resources (Table 4), and thus it is *part of larger bundles of resources* that facilitate the diffusion and improvements of such innovations. In contrast, both ecological and social resources were evident in *each* of the rare, inimitable, and non-substitutable categories (i.e., Table 2, 3 *and* 4). In other words, the economic emphasis was part of a larger, more holistic, understanding of valuable resources, never a focus unto itself. Second, each reference to economic well-being referred to enhancing the well-being of small-scale farmers and their communities, not to the well-being of the specific NGOs promoting the adoption and development of CA nor to the maximization of profits in terms of emphasizing exports or insertion in global value chains. Thus, consistent with Shivarajan & Srinivasan (2013) and Hall et al. (2012b), the emphasis on financial “value capture” is on behalf of the small-scale farmers targeting local markets.

In sum, consistent with Proposition 1, the data present strong evidence that the primary *value* of the key resources in this data set is more consistent with SI 2.0 and Radical RBV theory (community, socio-ecological well-being) than with SI 1.0 and Natural RBV theory (competitive advantage, maximizing profits).

***4.2 – Rarity, Inimitability and Substitutability***

As shown in Tables 2 through 4, while it is true that each of the (valuable) 17 resources shows some evidence of each of the other three sub-categories of VRIN/VCTS, more interesting is our finding that each of the 17 resources has a fairly clear *primary* emphasis on *one* of these three sub-categories (i.e., rarity/commonplaceness, inimitability/transferability, or non-substitutability/ substitutability). Six of the 17 key resources placed relative emphasis on rarity/commonplaceness (Table 2), four emphasized inimitability/transferability (Table 3), and seven emphasized non-substitutability/substitutability (Table 4).

First, the resources in the “rarity” grouping all describe well-established CA practices that are currently infrequently found on small-scale farms, and the capabilities to make these practices more commonplace. Second, the resources in the “inimitability” grouping all describe new and emerging CA-related practices that are going through the costly process of being developed and tested, and the capabilities to ensure that these can be transferred to and implemented by other small-scale farmers as appropriate. And third, the resources in the “non-substitutability” grouping describe the development of new bundles of resources required in the future that include, but go beyond, the local community, and the capabilities to institutionalize this larger infrastructure to benefit all small-scale farmers.

**-- insert Table 2 about here --**

*Rarity.* As shown in Table 2, of the 17 key resources or organizational capabilities in our data set, six place *particular* emphasis on the RBV idea of “rarity.” Each of the six refer to existing CA-related practices that have been proven to be effective in the field but which are relatively rarely used on small-scale farms, and the capability to make these practices more commonplace. In other words, this list identifies the capabilities to implement and make more common well-established CA-related practices. In particular, these include the key basic hallmarks of CA—minimum tillage and cover crops (Resource #5), crop rotation and planting of legumes (Resource #6)—which are to be the focal point of new programming initiatives (Resources #1 through #4).

Consistent with SI 2.0 and Radical RBV, NGOs in our study emphasize capabilities to make rare and valuable CA-related practices more commonplace among small-scale farmers. In contrast, results consistent with SI 1.0 and Natural RBV would have shown rarity as an opportunity for hoarding sustainable innovations in order to maximize financial self-interests (value capture). However, the key capabilities in our data set focus on promoting and sharing the CA-related practices for the benefit of everyone (value creation). Taken together, our findings lend support to Proposition 2.

**-- insert Table 3 about here --**

 *Inimitability.*As shown in Table 3, of the 17 key resources or organizational capabilities for improving the performance of small-scale farms, four focus on the development and diffusion of emerging (and not yet proven) practices that complement or enhance existing (proven) CA technologies. Such emerging innovative practices may be particularly costly to develop or copy by other organizations. Consistent with SI 2.0 and Radical RBV, the NGOs in our study sought to develop the capability to make these difficult-to-copy resources more transferable. For example, this is true for new (but not yet well-established) practices (Resource #7) like diversified family gardens (Resource #8) and farmer-led trials that nurture a learning-orientation among small-scale farm communities (Resource #9). These capabilities also include determining whether the CA-related practice of “planting stations” (known to be effective in Africa) will work in Central America, and if so, how to facilitate it (Resource #10).

Because such innovative practices and knowledge are costly to develop (and thus inimitable), from an SI 1.0 and Natural RBV perspective they should be protected/hoarded to gain competitive advantage. However, from an SI 2.0 and Radical RBV perspective the opposite is true: their costliness is precisely the reason that these valuable sustainable innovations should be disseminated broadly because it is important to facilitate the diffusion of emerging (costly-to-develop) innovations in order to benefit everyone. In sum, our findings lend support to Proposition 3.

**-- insert Table 4 about here --**

 *Non-substitutability.*Consistent with Radical RBV, SI 2.0 promotes the development of capabilities to create institutional infrastructures that allow organizations to jointly adopt and improve the innovation. For example, in our study this would be evident in developing a CA-sustaining institutional infrastructure that benefits small-scale farmers in the long-term.

As shown in Table 4, the remaining seven of the 17 total resources refer to capabilities to develop or enhance the infrastructure of the larger community that enables CA-related practices and innovation to be sustained in the long-term. They involve developing valuable “meta-resources” that cannot be easily/affordably replaced by other bundles of resources. Consistent with SI 2.0 and Radical RBV, the NGOs in the study seek to make these bundles available to all small-scale farmers. This involves activities that extend beyond the level of small-scale farms and their immediate local community, and includes things like: developing the capability of communities to monitor and evaluate systems related to their food security (Resource #11), the formation of farmer research teams (Resource #12), advocating for public policy changes on behalf of small-scale farmers (Resource #13), developing programming to target especially needy groups such as young people (Resource #14; see quotation below), developing a larger marketplace that can help farmers generate income via the sale of cash crops (Resource #15), developing community systems like seed banks where farmers can gain access to inputs and pay for it by subsequently providing access to similar inputs for their other farmers (Resource #16), and developing agro-ecological systems of production that reduce reliance on systems associated with industrial agriculture (Resource #17). As an example of the need for such larger infrastructure, consider the following:

“The lack of opportunity and desperation of Honduran youth is reflected by the estimated 1 million youth who have immigrated to the USA (of a total population of 8.1 million), and the fact that of those who attempt to immigrate, an estimated 1% die in the process. As a response, two of the five organizations [in the CFGB report] focused specifically on helping youth complete their education and become successful farmers. This demographic focus is generally not addressed in most food security programs, but merits the full attention and focus of food security programming” (Braul et al., 2011, p. 7).

Five of these seven capabilities are related to the economic dimension and focus on small-scale farmers’ abilities to generate income from the larger marketplace and to be weaned off external financial supports (which may be needed for start-up). These capabilities have a holistic function, seeking to combine all the pieces of the larger puzzle to improve small-scale farming in low-income countries. A hallmark of these resources is that they all go beyond the individual small-scale farms and often beyond the local community, and connect issues facing small-scale framers with public policy and the larger marketplace. This is consistent with an SI 2.0 perspective, which recognizes that the institutionalization of CA-related innovations requires a holistic, integrated effort where the community takes ownership.

 In sum, this attention to developing larger community structures and systems that facilitate and support sustainable innovation is consistent with Proposition 4, and with the emphasis on holistic well-being that characterizes SI 2.0 and Radical RBV, but would not be expected within SI 1.0 and the Natural RBV perspective.

**5 – Discussion**

This exploratory study, examining the key capabilities evident in a sample of 11 NGOs known for their exemplary work in promoting sustainable innovation (i.e., CA-related practices) for small-scale farmers in low-income countries, is the first empirical study we are aware of that examines SI 2.0 and the Radical RBV perspective. Our findings suggest that, taken together, SI 2.0 and Radical RBV offer considerable promise as conceptual and theoretical frameworks to guide further research and practice in the area of innovation for sustainable development. We hope that our exploratory study encourages further research in other settings and using other methods, and to further test and refine our understanding of the much needed innovations for sustainable development. We now discuss the implications of our study for the Resource Based View generally, and for innovation for sustainable development specifically.

***5.1 – A Richer Understanding of the RBV Framework***

Our use of RBV theory as a lens to examine NGOs promoting sustainable innovations among small-scale farms in low-income countries provides empirical support for speculated differences between SI 1.0 and SI 2.0, but it also provides a basis that may point to a richer and more nuanced understanding of the VRIN/VCTS framework at the core of RBV (relevant for Conventional, Natural, and Radical RBV). In particular, our finding that the 17 key organizational resources could be readily divided into three sub-groups—based on their emphasis on rarity, inimitability and non-substitutability—provides a welcome opportunity to enrich the RBV literature generally, especially in light of the observation that it is unusual for empirical studies to examine the separate VRIN characteristics at the conceptual level (e.g., Newbert, 2007; Talaja, 2012).

First, our findings support speculating that “rarity” may be especially important for resources related to an organization’s fundamental and proven core innovative practices at the grassroots level (literally so in the current study). These are the core hands-on innovative technologies that are evident in everyday actions in an organization. In our study it was about management practices related to the nature and quality of the soil on small-scale farms, and the interaction between food production and the soil, and how this related to food security at the farm level. In other settings it may be about an organization’s root technologies, processes and business practices that transform an input into an output.

Second, our findings support speculating that “inimitability” may be especially important for resources that are being newly-developed to enhance performance. Of particular note are emerging and thus difficult-to-copy sustainable innovations that are related to the core proven innovations that can be identified as “rare.” In a sense the resources in this category may be viewed at a level of abstraction higher than the more hands-on “rare” resources. In our study these were initiatives or experiments to test and create “new” knowledge and new management practices related to the core CA innovations. In other settings it may be about developing new technologies, processes and business practices that complement a firm’s core activities.

Third, our findings support speculating that “non-substitutability” may be especially important for resources that are holistic by their nature, and linked to larger institutions. Thus these resources have an even higher level of abstraction than “inimitable” resources. In our study they were part of a community’s socio-economic agro-ecosystems. In other settings they may be related to specific industry norms, organizational cultures, or national economic or trade policies.

Moreover, taken together our findings further suggest that these three valuable VRIN/VCTS dimensions may be related temporally (RBV has been criticized for its lack of dynamism and for its lack of understanding the processes that undergird it, e.g., Kraaijenbrink et al., 2010). It may be that rare resources are the easiest to implement and manage in the short-term, non-substitutable resources take the longest to develop, and inimitable resources represent the outcomes of learning processes that enhance on-going, long-term improvement and sustainability.

The implications of these speculative findings for management and theory may be significant. In particular, managing these different types, stages, and dimensions of the innovative process may require different kinds of management skills and organizational systems and processes. These challenges are further compounded by the temporal interplay among the different types of resources as, for example, inimitable resources may over time become more familiar and thus more akin to rare resources. These observations about the differences among the VRIN/VCTS components, and how they may change over time, are important topics for future research and theorizing within RBV generally, as well as innovation for sustainable development specifically. They draw attention to the holistic nature of sustainability, and the inherent advantage a more holistic approach like SI 2.0 has compared to a narrower financial-well-being focused approach like SI 1.0.

***5.2 – Sustainable Innovation 2.0 and the Double Bottom Line Approach***

 Our study employed a SI 2.0 and Radical RBV perspective to examine NGOs engaged in promoting CA-related innovations among small-scale farmers in low-income countries. We found that, as predicted, these NGOs placed their primary emphasis and holistic socio-ecological “value creation” while financial “value capture” played a secondary role. This is consistent with the double bottom line approach, which has a primary focus on enhancing socio-ecological well-being while maintaining financial viability, where the meaning of the latter is determined on a case-by-case basis and may differ from one organization to another.

Of course, it may be that organizations applying this approach are very rare in the world, and perhaps especially in the business world. After all, we did deliberately seek a research setting where the SI 2.0 would be most transparently observable. We fully understand that SI 1.0 may be seen as more relevant in traditional business settings under the current paradigm. Indeed, if we had chosen to examine the key capabilities of conventional businesses seeking to help groups like small-scale farmers in low-income countries, then our findings may have been very different and provided support for the SI 1.0 and Natural RBV perspective. For example, we expect that our findings would have lent more support to SI 1.0 than to SI 2.0 if we had chosen to study large businesses who provide such small-scale farms with conventional external inputs like fertilizer and pesticides.

That said, we wonder whether there has been a tendency for management scholars to overlook sustainable development consistent with SI 2.0 and Radical RBV approaches, perhaps because of the norms to fixate on businesses that emphasize financial value capture (e.g., Ferraro et al., 2005), and perhaps also because we lack well-developed conceptual frameworks/lenses to “see” the more holistic hallmarks of the SI 2.0 approach. This study helps to further develop such alternative lenses. Indeed, we suspect that SI 2.0 may be far more common than is evident in the mainstream literature. For example, there are over 40,000 NGOs working in low-income countries to nurture viable and sustainable economic activity (Duke & Long, 2007), many seeking to address the enormous sustainability challenges facing low-income countries (e.g., Silvestre, 2015a). We believe that the SI 2.0 approach is of particular relevance to organizations in this sector, and provides precisely the sort of alternative management theory and practice called for by scholars like De Schutter (2010), Joshi (2009, 2011), Lele & Trigo (2010), Meyer (2010), Pretty et al. (2011) and Silici et al. (2011). Moreover, a SI 2.0 perspective may also be very relevant in high-income countries in fields like social entrepreneurship, benefit corporations, the fourth sector, hybrid organizations, humanistic management, and others (e.g., Bell & Dyck, 2011; André, 2012; Battiliana et al., 2012; Davis, 2013; Gaffney, 2012; Hoffman et al., 2012; Von Kimakowitz et al., 2011).

Finally, note that the NGOs examined in this study are working in a sector that encompasses at least one-third of humankind, and address some of the most important social and ecological issues facing the world. For reasons like these we suggest that future research should continue to examine SI 2.0 in the agriculture sector. However, other economic sectors can also become interesting arenas for further research, especially activities that employ and/or serve large amounts of people such as the mining, energy, and transportation sectors. Even if organizations with a SI 2.0 orientation are rare—though we believe they are far more common than is typically reflected in the mainstream management literature—they have important implications in terms of both management practice and theory.

**6 - Conclusion**

The contributions of this paper are fourfold. First, our study advances RBV theory by providing an empirical examination of the interplay between the individual components of the VRIN/VCTS framework, and by providing the first empirical study we are aware of that connects Radical RBV and the SI 2.0 perspective. Second, our paper advances the sustainable development literature by promoting a “double bottom line” approach that can be seen to complement or offset the so-called triple bottom line approach. The double bottom line approach seeks to enhance positive social and ecological well-being, rather than emphasizing the reduction of existing negative externalities. Its primary emphasis on the social and ecological dimensions (while the economic dimension remains subservient) is consistent with the sort of approach required to address critical socio-ecological challenges facing humankind today. Third, our paper advances the sustainability and innovation literatures by proposing what we call Sustainable Innovation 2.0, which is consistent with the double bottom line paradigm and its emphasis on socio-ecological value creation instead of financial value capture. Fourth, our study makes a valuable contribution to those who have called for the development of alternative management theory and concepts that are relevant for the promotion of CA among small-scale farms specifically, and more generally is relevant for anyone seeking management theory that allows escape from the self-fulfilling prophecies embedded in Max Weber’s materialistic-individualistic iron cage (Weber, 1958).

In conclusion, we are skeptical that the socio-ecological issues facing the planet can be resolved by sustainable innovations within the mainstream SI 1.0 paradigm. As Einstein noted, “Humanity is going to require a substantially new way of thinking if it is to survive.” We believe that SI 2.0 represents such a new way of thinking about sustainable innovations that can address the challenging socio-ecological crises facing humankind, especially with regard to issues which seem to defy resolution when they are addressed in a way that focuses primarily on enhancing a firm’s financial wealth maximization. In particular, we believe it is critical to develop management theory and practice that renders financial well-being subservient to socio-ecological well-being. Failing to do so leaves any theory about sustainable innovation and development vulnerable to becoming co-opted by the self-fulfilling prophecies embedded in the mainstream profit-maximizing paradigm (just as the CSR paradigm has been coopted; see Margolis & Walsh, 2003; Ferraro et al., 2005). The theory developed here is relevant not only for small-scale farmers in low-income countries, but perhaps even more so for the rest of us whose lifestyles contribute to the trajectory of the socio-ecological crises the planet is facing.

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**Table 1: Sustainable Innovation 1.0 vs 2.0**

|  | **Sustainable Innovation 1.0** | **Sustainable Innovation 2.0** |
| --- | --- | --- |
| **Key underpinning assumptions**  | - Primary motivation is financial “value capture” achieved through sustainability initiatives.- Focus on reducing negative socio-ecological externalities and risks.- Triple Bottom Line: balanced approach among the three key dimensions: financial, environmental, and social.  | - Primary motivation is socio-ecological “value creation” while contributing to financial viability.- Focus on enhancing positive socio-ecological externalities.- Double Bottom Line: enhanced social and ecological well-being while maintaining financial viability. |
| **Definition of Sustainable Development** | - (Economic) “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” | - Socio-ecological development that enhances the ability of present and future generations to meet their own needs. |
| **Dominant organization theory** | - Natural Resource Based View  | - Radical Resource Based View |
| **Resources** (e.g., organizational capabilities, know-ledge, practices, ethics, physical and human traits) | - A sustainable innovation is viewed as an organizational asset that creates financial value for an organization, its shareholders, and a limited set of stakeholders.- Contributes to the organization’s ability to establish a competitive advantage. | - A sustainable innovation is viewed as an organizational asset that creates socio-ecological well-being for an organization, its shareholders and all stakeholders.- Contributes to the organization’s ability to responsively generate and support overall socio-ecological well-being. |
| **Valuable** (for value capture vs for value creation) | - The sustainable innovation is valuable if it enables a firm to exploit opportunities to enhance its financial performance through appropriation while also reducing negative socio-ecological externalities.  | - The sustainable innovation is valuable if it enables an organization to exploit opportunities to enhance overall socio-ecological well-being, while also contributing to a firm’s financial viability. |
| **Rare** (vs Common) | - In order to enhance its financial interests, an organization should seek to ensure that its (valuable) sustainable innovation is held by no/few other current or potential competitors (e.g., by concealing strategic resources)  | - In order to enhance overall socio-ecological well-being for humankind, an organization should make its (valuable) sustainable innovations available to others (e.g., by sharing strategic resources)  |
| **Inimitable** (vs Transferable) | - In order to enhance its financial interests, an organization should seek to ensure that its (valuable) sustainable innovation is costly to develop or copy by others (e.g., by patenting the innovations).  | - In order to enhance overall socio-ecological well-being for humankind, an organization should transfer knowledge about its (valuable) sustainable innovation to others (e.g., by teaching others about the innovation) |
| **Non-substitutable**(vs Substitutable) | - In order to enhance its financial interests, an organization should seek to ensure that its (valuable) sustainable innovation cannot be easily/affordably replaced by other (bundles of) resources (e.g., by increasing switching costs and spending on marketing).  | - In order to enhance overall socio-ecological well-being for humankind, an organization should ensure that its (valuable) sustainable innovation may be easily/affordably replaced by other (bundles of) resources (e.g., by helping to develop institutional infrastructures that allow organizations to jointly adopt and improve the innovation). |

Source: Adapted from Bell & Dyck (2011), Santos (2012) and Walske et al. (2013).

**Table 2: Instances of taking rare resources that are already-proven-to-be-effective, and making them commonplace**

Resource #1 (social): *“To keep programs focused and manageable, food security projects should initially focus on only a few key [already-proven-to-be-effective] innovations that are shown to improve food security* [social] *at the household level”* (Braul *et al*., 2010, item #5, p.1: elaborated on p. 3: *Additional innovations should only be considered after the initial innovations are well established”*).

Resource #2 (social): “*Integrated food security programs play an important role in recognizing the diversity of factors affecting food security at the household level* [social], *but must also remain grounded in a few key [already-proven-to-be-effective] and complementary interventions”* (Braul *et al*., 2010, item #6).

Resource #3 (social): “*[Already-proven-to-be-effective] Food security programming by the CFGB network in Central America should be promoted in rural areas where high food insecurity exists”* [social] (Braul *et al*., 2011, item #4, p. 1).

Resource #4 (social, ecological): “***Networking*** *- The rich and vast amount of [already-proven-to-be-effective] knowledge and practical experience around agro-ecological* [ecological] *systems that is already present in Honduras and likely other Latin American countries should be the source to model future food security programming in Latin America”* [social] (Braul *et al*., 2011, item #9, p. 2).

Resource #5 (ecological, social): “*Minimum and zero tillage, soil retention barriers, agro-forestry systems and green manure/cover crops (gm/cc) are [already-proven-to-be-effective] essential methods to improve soil fertility* [ecological] *and the food security* [social] *of smallholder farmers in Honduras and other Central American countries where corn/bean based production systems dominate”* (Braul *et al*., 2011, item #2, p. 1).

Resource #6 (ecological, social): *“Enhancing the programming capability to develop and implement projects which conserve water and soils must receive greater attention”* [ecological] (Braul *et al*., 2010, item #3, p. 1; elaborated on p. 3: *“Partners and project participants identified [already-proven-to-be-effective] conservation agriculture systems and the introduction of legumes (both as a main crop and intercrop) as key interventions which are having the greatest impact on achieving food security* [social]*. These innovations are also key climate change adaptation activities* [ecological]*”*).

**Table 3: Instances of taking emerging and thus difficult-to-imitate resources, and making them easy-to-transfer**

Resource #7 (social): *“The CFGB network needs to share the many [emerging] unique and innovative technologies implemented by partners which are having a significant impact on enhancing food security* [social].*”* (Braul *et al*., 2010, item #1, p. 1; elaborated on p. 3: *“Unfortunately, these technologies are not [yet] widely shared between partners and members. Identification, description and dissemination of these innovate farming practices to improve food security must therefore become a priority”*)*.*

Resource #8 (social): “*The CFGB network should investigate the food security impacts* [social] *of the [emerging] diversified family garden and incorporate the concept into food security projects”* (Braul *et al*., 2011, item #3, p. 1).

Resource #9 (social): *“Innovative [emerging] production technologies to improve food security* [social] *are most effective when they are managed in farmer-led trials rather than on model farms”* (Braul *et al*., 2011, item #10, p. 2).

Resource #10 (social, ecological): *“Further investigation is required to determine how the [emerging and not-yet-proven-in-Central America] conservation farming system characterized by planting stations and mulch by CFGB partners in Africa may be applied in the Central American context”* (Braul *et al*., 2011, item #8, p. 2: elaborated on p. 8:*“The adoption of conservation farming (CF) by smallholder farmers in southern Africa has resulted in significant improvements in food security* [social] *through the use of minimum tillage using planting stations, precision nutrient placement, rotations and mulching* [ecological]. *Given the success of the CF model, a careful analysis of the applicability of this technology to hillside agriculture currently practiced in Honduras and other Central American countries is necessary”).*

**Table 4: Instances of taking non-substitutable resources, and making them substitutable**

Resource #11 (social): *“[Institutional infrastructural] Capability building on developing strong monitoring and evaluation systems must be enhanced”* (Braul *et al*., 2010, item #7, p. 1; elaborated on p. 4:*“Building capability in this area [i.e., monitoring and evaluating a community’s systems around food security] through workshops, mentoring and other training approaches is recommended to both improve the ability of partners to measure the impact of their food security program and simplify reporting”*).

Resource #12 (social): *“Community participation and project ownership are key [institutional infrastructural] elements that improve the success and sustainability of projects and should be highlighted in proposal and reports”* (Braul *et al*., 2010, item #2, p. 1; elaborated on p. 3:*“In particular, the formation of farmer research teams to discuss and experiment with new innovations must be promoted within the CFGB network”* [social]).

Resource #13 (social, economic): *“The CFGB network needs to increase support to partners who are advocating for appropriate [institutional infrastructural] public policy changes that could ensure sustainable food security initiatives”* (Braul *et al*., 2010, item #4, p.1; elaborated on p. 3:*“The CFGB network needs to increase support to partners who are advocating for appropriate public policy changes that could ensure sustainable food security* [social] *initiatives such as policies that improve access to land, strengthen agricultural input and output markets* [economic], *increased technical support to small scale farmers, good governance* [social]*, etc.”).*

Resource #14 (social, economic): “***Assisting Youth to Become Successful Farmers*** *– Designing and implementing [institutional infrastructural] agriculture development programs for youth to help them establish economically viable farming operations* [economic] *is essential for sustainable rural development* [social]*”* (Braul *et al*., 2011, item #6, p. 2).

Resource #15 (economic, social): “***Income Generation*** *– Food security programs should [attend to institutional infrastructural issues that] look beyond immediate subsistence food production systems by developing cash crops that diversify the production system and generate income* [economic] *in order to improve food security* [social]. *This focus will help make smallholder agriculture an attractive economic option for the future”* [economic](Braul *et al*., 2011, item #5; p.1; elaborated on p.11: “*All of the projects visited had some component of income generation integrated into their projects, most notably through the production of crops almost exclusively for cash income,* [economic] *such as coffee, cashew, lumber, fruit, vegetable production, honey, processed vegetable products, dairy, and the sale of excess basic grains. Of particular relevance was the relationship between higher education, cash production, and the ability of youth to achieve the means to support a new family off the land as an option of choice. This is critical for a new generation of farmers to be created, instead of a continual flow of youth to urban areas and abroad, with the consequent social disintegration* [social].*”*).

Resource #16 (economic, social): *“****Input Incentives*** *- To enhance project sustainability and increased community ownership* [social], *external input incentives* [economic] *in food security projects should be minimized or removed”* (Braul et al, 2011, item #1, p.1; elaborated on p. 5: “*When food security projects are implemented in regions where farmers have some assets, building the [institutional infrastructural] capability of farmers to use local resources and develop management skills must be emphasized* [social] *over the provision of external inputs* [economic]. *If external inputs are used, the beneficiaries should be responsible for some or all of the costs. Ownership is proportional to investment. In addition, there must be an exit plan developed already at the beginning of a project when inputs are provided to assure that the approach is sustainable”*).

Resource #17 (ecological, economic, social): *“To improve food security, projects should promote [institutional infrastructural] agro-ecological production systems that replace or reduce the use of fertilizers and herbicides and maintain long-term production through a holistic approach* [ecological].(Braul *et al.*, 2011, item #7. p. 2; elaborated on p. 7: *“All the organizations visited emphasized the use of agro-ecological systems of food production as the best approach to meet current household food consumption needs* [social], *produce food for surplus sales* [economic] *and assure long-term sustainable production levels* [ecological]. *… On average, smallholder farmers claimed that their yields approximately doubled using agro-ecological systems* [economic, social]*”*).

1. This is the penultimate version of: Dyck, B. & Silvestre, B. (forthcoming). Sustainable Innovation 2.0: Enhancing socio-ecological value creation even when this does not maximize financial value capture. *Journal of Cleaner Production*. [↑](#footnote-ref-1)
2. It is estimated the 70% of the world’s 800 million chronically malnourished people are small-scale farmers (Locke, 2015), and that the social and economic costs associated with malnutrition may be as high as US$3.5 trillion per year (FAO, 2013). [↑](#footnote-ref-2)
3. Note that by prioritizing socio-ecological value creation over firm-specific financial value capture, SI 2.0 goes beyond and addresses “the most fundamental problem” underlying Porter & Kramer’s (2011) approach to value creation, namely “its view of the firm as an entity whose only legitimate purpose is the generation of economic value for the firm and its owners” (Crane et al., 2014, p. 142). [↑](#footnote-ref-3)
4. Tilling land releases about one tonne of carbon per hectare per year (Joshi, 2011; note that the earth’s cultivated soils have lost about 60 percent of their original carbon stock, though there is still about twice as much carbon stored in the earth’s soil than in its atmosphere and plants combined, Schwartz, 2014). [↑](#footnote-ref-4)
5. No-till agriculture has been estimated to sequester about one-third tonne of carbon per hectare per year (Franzluebbers, 2004, cited in Kremen & Miles, 2012). In addition, organic practices like CA are associated with far greater positive ecological externalities in terms of their contribution to larger ecosystem services ($460 to $5,240/ha.) compared to conventional agriculture ($50 to $124/ha.) (Sandhu et al., 2008). [↑](#footnote-ref-5)
6. The researchers’ familiarity with the field came via visiting several regions in the world to visit small-scale farms in low-income countries where CA and similar practices were being implemented (including Argentina, Bolivia, Peru, Brazil, China, North Korea, and Paraguay; one of the researchers had also visited agricultural projects in Africa at an earlier time). Taken together, this provided the authors with a first-hand understanding of CA and small-scale farms in the far reaches of the world and facilitated the interpretation of the data. [↑](#footnote-ref-6)