

Article

‘Milk is Milk’: Organic Dairy Adoption Decisions and Bounded Rationality

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Received: 30 September 2013; in revised form: 4 November 2013 / Accepted: 14 November 2013 / Published: 13 December 2013

Abstract: Bounded rationality is an especially appropriate framework for organic dairy adoption decisions as it recognizes internal and external constraints which are critical in understanding complex farm decision making. Farmers use of, and access to, information is examined using interview data gathered from organic, conventional, managed graziers, and Amish dairy farmers in Southwestern Wisconsin at a time when organic milk prices offered a 50% premium over conventional prices. Focusing on certain aspects and impressions of organic dairy, such as the sentiment that “milk is milk”, may lead to information satisficing where farmers do not take full advantage of the information available to them. Organic farmer interviews reveal the challenges they faced with bounded rationality constraints and how they countered these challenges with the help of social networks, as well as how situational factors such as economic and health crises may have motivated them to adopt organic dairy. The interview data from organic and conventional farmers alike also reveals how many conventional dairy farmers utilized information strategies which did not fully consider the pros and cons of the organic system. A bounded rationality framework could enlighten policy makers and educators as they tailor sustainable agricultural policy design and information dissemination strategies to serve the diversity of farmers on the landscape.

Keywords: organic; bounded rationality; decision making; dairy; managed grazing; Amish

“Aren’t you going to get on a [soap] box and tell her what a crock this organic is?” says Mrs. Teiner; to which Mr. Teiner replies, “You could take two glasses of milk and there’s nothing different. It’s like buying premier jeans. The jeans are probably the same material...but just twice the price, just because of the name [so]...Why [do] people pay for it?”

Mr. Teiner, Conventional Dairy Farmer in Southwest Wisconsin

1. Introduction

“Milk is milk” was a common sentiment depicted in the quote above among dairy farmers in Southwestern Wisconsin at a time (2005–2008) when the adoption of organic dairy farming was accelerating rapidly in the region, and organic dairy farmers were reportedly prospering relative to other types of dairy farmers. “Milk is milk” reflects the belief that all milk is wholesome and nutritious regardless of management system, and more specifically that organic is no different from conventional milk in quality as illustrated by the comparison with premier jeans in the leading quote. This sentiment focused the comparison on whether a ‘composition’ test would show organic milk components to be different in any way from conventional milk, and if not then what was the big deal about organic. “Milk is milk” was one of a number of responses given by non-organic dairy farmers when they were asked about adopting organic dairy farming practices which may have indicated that they were not fully considering organic dairy as a viable option.

In the years leading up to this interview study, organic dairy farmers in Wisconsin were more highly satisfied with income and overall quality of life than conventional dairy farmers according to statewide survey research [1,2]. At the time of the interview study, the growth in demand for organic milk was outpacing the growth in supply. There was also a sustained price premium for organic milk and organic milk pay prices that the farmer received were much more stable than conventional milk pay prices that farmers received. Moreover, many dairy farms in Southwestern Wisconsin were well suited to convert based on their scale, biophysical features, and ongoing use of pasture as a significant source of forage for their cows [2]. A “Help Wanted: Organic Farmers” campaign had been launched in February of 2005, and was supported actively by several commercial and non-profit organizations. Organic Valley, the nation’s largest organic dairy cooperative, with its headquarters in the region, co-led the campaign as they were building on their leading role in marketing organic dairy products in the United States [3].

At the time, pay prices to Organic Valley members had been stable and rising for almost a decade, providing on average about a 50% premium over conventional milk prices (for more detailed information on conventional and organic milk prices, please refer to Figure 3 in Brock and Barham, 2008 [2]). Later, in the subsequent deep recession of 2008–2009 when conventional dairy prices plummeted by almost 50 percent, Organic Valley’s pay prices declined by less than 10 percent, thanks in part to the cooperative’s choice to pursue private sector supply management as a price maintenance strategy [4,5]. Thus, while net incomes of non-organic dairy farmers mostly turned strongly negative, organic dairy farmers’ finances stayed mostly in the black. This outcome, ironically enough, hinged to a significant degree on the fact that organic dairy farmers were part of a segmented and more stable market (‘milk was not milk’), within which consumer preferences helped to sustain large price

differences for reasons that may or may not have been based on their perceptions about real differences in organic milk's component composition. Against that recent background, this article explores why it seemed that many farmers in the study region were not really considering the organic dairy adoption choice in the years preceding the recession (2005–2007). This period was a time when many farmers in Southwestern Wisconsin did choose to adopt 'organic' and this growth led Wisconsin to become the second largest organic dairy producing state in the country [6]. However, there were far more farmers who seemed well set up to go organic but did not seem to be considering it seriously as a relevant management strategy. Through in-depth, qualitative interviews, we explored the question of organic adoption within the broader framework of how farming system choice matched farmers' goals and aspirations in four domains: economic, ecological, social, and spiritual (This framework will be denoted by the Greek work 'oikonomia' which is related to the origins of economics. This oikonomia theme is explored more extensively in Brock and Barham, Forthcoming [7]). This perspective built on the work of other researchers who had found that farmers have diverse economic, social/spiritual and ecological values that motivate them to farm and choose distinctive management systems (e.g., [8,9]).

The primary theme of this article is that the organic adoption choices of Southwestern Wisconsin dairy farmers appear to be shaped in many cases by bounded rationality heuristics rather than informed comparisons between options. This argument is illustrated here by the "milk is milk" idea, but it is explored more deeply in the remainder of the article using a rich portrayal of distinctive bounded rationality approaches that were developed using the words of the farmers and our interpretation of them in relationship to their farm context. We interviewed a diverse set of small and moderate-scale farmers including conventional, Amish, and even some managed graziers whose farm management practices overlapped notably with organic farms.

As first explained by Simon (1955), bounded rationality refers to situations when decision makers face choices in which they lack access to the full information about the problem in question, and/or the time and cognitive capacity to systematically weigh advantages and disadvantages [10]. In contrast, full rationality assumes complete access to information and the time and human capacity to wade through and process the available information effectively [11]. Most adoption analyses assume fully informed rational decisions based on careful consideration of all the information available about a new technology. In this article, we define bounded rationality as a behavioral approach that recognizes that internal constraints (*i.e.*, cognitive limitations and biases) and external constraints (*i.e.*, uncertainty, limited time and resources) are both critical elements that help explain complex farm decision making, such as the decision to adopt organic practices.

We view bounded rationality to be an especially appropriate framework for organic dairy adoption decisions due to the complexity associated with shifting all of the major farm management systems (crops, forages, and animal feeding and healthcare) and the ongoing challenge of accessing reliable information and support around organic dairy farming. In the process of examining the role of bounded rationality, we also consider how social networks can help farmers to overcome information constraints and learning challenges, or, in other instances reinforce biases and shape relatively information-poor decision-making processes. The organic adoption decision is described with an emphasis on farmer experiences and/or potential concerns with the shift, the informational constraints they perceived around this new approach to farming, and the role of social networks in their information acquisition and processing.

Our exploration of organic adoption decisions is based on narratives that were constructed directly from the ideas, experiences, and decisions of farmers who were interviewed between August of 2006 and June of 2008 using semi-structured methods. Almost all of the 60 dairy farmer interviews in Southwestern Wisconsin were selected from a larger base of respondents from two random-sample surveys [2]. Nearly a third of the respondents were already farming organically, and most of the others had similar operations in terms of landscapes, scale of operation, and reliance on pastures for a significant share of the feedstock. Thus, the objective differences across many of the farms were relatively small. In fact, only one or two of the conventional dairy farmers in the sample of 60 interviewed were so far down the conventional path that the ‘sunk costs’ of equipment, management strategies, and information investments were significant barriers to going organic. For the remainder of the sample, the farmer’s explanations for not adopting organic were considered relative to their preferences and values, the informational barriers and concerns they identified, the social networks they described, and the biases they displayed.

To the limited extent that previous researchers have attempted to develop empirical portrayals of bounded rationality behavior, it is generally done in the laboratory with highly controlled experiments involving games with payoffs under uncertain conditions [12,13]. By contrast, our discussion of bounded rationality behavior relies mostly on narratives, which for the sake of brevity are documented in an on-line appendix and selectively exploited in the text. In this regard, our bounded rationality research is unique because there are very few agricultural studies on adoption of any technology where bounded rationality issues play a prominent role in the analysis of farmer decisions.

At a deeper epistemological level, we face the challenge that it is difficult—if not impossible—to know what farmers know and do not know about all of the farming system options and to apply that knowledge to their particular farming situation. Thus, as researchers our interpretation of the on-farm interviews was also bounded by significant informational constraints. The best we can offer is to illustrate the bounded rationality behaviors that appear to guide the farmers’ choices. Perhaps this illustration will encourage other researchers to consider incorporating similar concerns into their analyses of farming system choices, particularly new ones that involve significant changes and uncertainties, where what farmers and researchers do, and can, know about the options is likely to be constrained by real informational limitations.

The structure of the article is as follows. The next section develops our bounded rationality framework for studying the organic adoption decisions of dairy farmers, and relates it initially to the applied social science literature on local knowledge and networking with respect to farm management choices. Our integrated bounded rationality framework centers on the concept of information satisficing. Decision makers who exhibit minimal information satisficing will exhibit reasonable efforts to overcome objective constraints on time and information processing. Those farmers who exhibit a lot of information satisficing will oversimplify a complex decision into one that may be characterized by such narrowly construed views as ‘milk is milk’ or some other singular line of argument. Section 3 elaborates on our field methods and the article’s use of the narrative form and semi-structured interviews as a way of developing the empirical analysis of bounded rationality behaviors or attitudes. Section 4.1 explores the experiences of organic adopters. Organic farmers confronted and overcame bounded rationality challenges to become early (or later) adopters. Organic farmers also discussed their own observations on how non-adopters were ‘information satisficing’ in a variety of ways

including using statements or biases that may have not been pertinent to the potential viability of the organic management system to guide their choices.

The remainder of the empirical analysis (Section 4.2) explores experiences of non-adopters and how their explanations for non-adopting relate to a variety of information gathering themes. Because non-adopters often state multiple rationales that include their values and goals and a range of concerns with organic dairy farming and how it might work, this empirical analysis proves to be more illustrative than conclusive about the role of bounded rationality in any particular decision. It also features a comparison of two neighboring Amish communities and how bounded rationality behaviors in one of them constrain the organic adoption opportunities of the other. Overall, it is our view that the use of a framework of bounded rationality behaviors and values improves our capacity to understand adoption choices of a diverse array of farmers and the various communities that surround them. And, we hope that this approach can help to inform private and public strategies aimed at overcoming information constraints and biases especially related to emerging alternative farming systems.

2. Bounded Rationality in Organic Dairy Adoption Decisions

This article's emphasis on bounded rationality and the social dimension of knowledge builds on previous household farm decision literature that discusses the role of information access (e.g., [14–16]) and the adoption of alternative agricultural methods (e.g., [8,17–20]). The social dimension of knowledge acquisition is highly interconnected with bounded rationality issues given the distinctive and complex nature of information required to manage organic systems (much of which is tacit or local knowledge) and the limits to acquiring information on organic farming [21]. Bell's work discusses how bounded rationality issues impact adoption decisions of sustainable agriculture without using the 'bounded rationality' term explicitly. In his view, farmers have to negotiate a lot of uncertainty, and this may explain a reluctance to try different strategies. As Bell states, "farmers can't spend all day reading farming magazines, cruising the Internet, talking to sales people and having coffee with locals at the café in town" when they are making decisions about their farm. Social networks like Practical Farmers of Iowa can help counter real information constraints [17].

Holistic organic dairy adoption research also emphasizes the unique factors involved with a comprehensive system shift into organic dairy management ([19,20]). They too combined data from interviews and surveys to understand the information gathering processes involved in the choices. Lunneryd's work focuses particularly on information use in organic dairy adoption and his discussion refers to bounded rationality, but it is not a central theme in his work as it is here ([20]).

As mentioned above, our household decision-making framework integrates (economic, social, ecological, and spiritual value dimensions) and bounded rationality. We adopted a bounded rationality framework, because we perceived both actual information and knowledge transfer constraints associated with complex farm decisions, and it helped to make sense of the wide range of decision-making heuristics and approaches expressed in the farmer interviews. The bounded rationality framework emerged from an analysis of a substantial number of early interviews in the spirit of grounded theory [22]. It helped to elucidate the divergent perspectives and arguments offered by farmers on common issues that seemed to reach beyond values into what they were willing or able to understand about the options facing them. Since Simon's seminal work ([10]), the potential importance of bounded

rationality in new or highly uncertain situations has been a reoccurring theme but has generally not been included in behavioral models of technology adoption. In those cases when bounded rationality concerns are explicit, information satisficing strategies are often viewed as a principal way that decision-makers overcome real or perceived time limits, lack of capacity or information to address uncertainties, or other informational constraints [23,24]. In this article, we use ‘information satisficing’ to describe the overarching bounded rationality behavior that guides decision-makers in uncertain situations with significant information gathering and processing costs. Different types of information satisficing can lead to status quo bias where decision makers give automatic preference to their current situation/management practices since they are more concerned about their past investments than future possibilities [25,26].

We differentiate along a continuum of behaviors that involves distinctive approaches to both information gathering and criteria that guide those decisions especially non-adoption. Ambiguity aversion, an example of a low level of bounded rationality, occurs when information that can help to address uncertainty is difficult to obtain [27]. Some agents may be averse to change as a result of the ambiguity or uncertainty [28]. Ambiguity-averse decision makers may not be able to estimate probabilities of different events based on their decisions, and this information barrier may discourage these decision makers from fully considering systematic management changes. For this particular article, ambiguity aversion will be used primarily to describe those farmers who explicitly state that there are elements of the organic systems where they have difficulty understanding the risks and returns in play, but that they were otherwise open to considering the options.

Anchoring is a heuristic method in which decision makers focus on a limited component of a problem which may or may not be highly relevant as a guide to comprehensive decision-making [29–31]. Because decision makers tend to adjust their choices based on initial experiences or pieces of information under experimental conditions [32], anchoring can also be the result of an incomplete computation [29]. Anchoring can also be viewed as “one-reason decision making” where agents do not necessarily optimize over a range of aspirations that might otherwise be present in typical decisions [30]. Anchors are attractive as they are often time-saving and serve to simplify complex decisions. Given that everyone operates with limited time and cognitive ability, it is no wonder that many of us use anchors as a way to navigate the complex world. Examples of issues that conventional dairy farmers might anchor on include concrete sub-goals like crop prices and the cost of other organic inputs, rather than looking at the profitability of the whole farm system. Organic farmers can also operate in a bounded rationality framework with regards to conventional farming. There are some obvious technologies that organic farmers will not explore like the use of rBST and many synthetic chemicals because they are not allowed within the organic system. Therefore, organic farmers will information satisfice about these choices at a fairly high level, but may also satisfice on other more ‘conventional’ practices that could crossover. Anchoring can limit information gathering about the larger context and thwart fuller consideration of an important choice such as a farming system change.

Some anchors are so limiting that they do not seem to be of much relevance to the decision making process. This phenomenon will be denoted here as extremetization and this tends to arise when a decision maker anchors on a particular issue and makes sweeping generalizations out of extreme and potentially complex cases. A key example of extremetization in this study is the frequent use of the idea of “milk is milk” as an anchor for deciding about organic dairy adoption. This sentiment explicitly

bypasses farm profitability comparisons, farmer satisfaction with the management system, and/or an open-minded view of factors shaping consumer preferences. By contrast, this sentiment seems to reflect views such as organic milk is part of a marketing scam, or it is a reaction against the idea of the inferiority of conventional milk and those who produce it. Other examples of extremization with regards to organic adoption could include focusing on stereotypes of organic farmers being hippies and/or old-fashioned. These stereotypes, like the idea of “milk is milk”, should have no bearing on whether the management system is a viable option for the farmers in question.

We close this conceptual section by highlighting how social networks can influence access and exposure to information in ways that may encourage or discourage consideration of alternative management systems. If farmers are subject to a certain kind of bounded rationality, this may lead them to choose to interact with other farmers who think like them which may further perpetuate these bounded rationality constraints. Farmer adoption decisions especially regarding complex systems such as organic dairy are embedded within networks of existing farmers [20,21,33–35]. Social networks in sustainable agriculture knowledge transfer are often depicted in ways that encourage consideration of alternative adoption choices [17,18,36–38] as social networks can help farmers overcome the challenges of limited information and perceptions on organic dairy. Social networks can also reinforce extreme types of information satisficing behavior which can also thwart self-critical reflection [39]. Socially specific satisficing behavior may be especially crucial to the adoption of organic systems given that a significant amount of information is transferred in social settings [19,20,34].

Our particular study area, Southwest Wisconsin, had a disproportionate share of the state’s organic dairy farms. Moreover, even within this area, clustered patterns of adoption were evident on the landscape, that seem to grow out of farmer-to-farmer interactions in the Kickapoo Valley region of this study [40]. This pattern of clustering of organic dairy farmers was also evident in other geographic areas [41,42]. In this particular region, there is a growing proportion of dairy farms being owned by Amish farmers (about 10% of the state’s dairy) [43]. Amish farmers would seem to be particularly well situated to convert to organic considering certain aspects of their operations (small size, labor intensity, low cash inputs). As will be discussed below, the Amish will be helpful to explore a particular type of information satisficing which will be denoted as principled satisficing [7] where values can interact with bounded rationality issues to constrain information gathering by agents [44].

3. Methods–Field Work, Narratives, and Empirical Illustrations

Farm decisions related to organic dairy adoption were explored using approximately 60 semi-structured farm interviews within a 65 mile radius of Organic Valley. The majority of participants were originally survey respondents in a random statewide sample of conventional and grazing farmers in 2003, a state-wide census of organic dairy farmers, and a census of Amish dairy farmers who sell milk to an Amish canned milk co-op in Southwest Wisconsin. The majority of interviews on farm management strategies were conducted between August of 2006 and June of 2008, solely by the lead author. They, too, were mostly randomly selected, though in a stratified manner to be representative of the diversity of dairy farming strategies in the region [2] [Farmers were categorized by the farm management type indicated on the surveys (organic, conventional or managed grazing), though a number of the farmers

had since switched management systems between the time of survey completion and when the interview was conducted].

Interviews lasted approximately one and a half hours but varied in length depending on time availability and conversation style of the farmer (Introductory letters were sent to potential interviewees explaining the project with a list of the general topics that would be covered. The introductory letter was followed up with a phone call a week later. A return postcard was included in the letter for the Amish who do not have phone access for the purposes of scheduling a time range for interviewing. Interview participants completed a consent form). The number and types of farmer informant interviews were based primarily on the goal of gathering a diversity of farmer opinions on organic dairy adoption decisions. (In addition, key informants were interviewed to expand upon themes and offer further background and perspective at a more aggregate level than the individual. Two of the grazing network leaders had grazing cow dairy operations, and all of the grazing network leaders had some kind of grazing livestock on their farm. Six grazing network leaders were also interviewed toward the end of the interview process to insure a perspective from more intensive graziers. Grazing networks are groups of farmers who exchange information about pasture management which are localized within regions. They often will organize pasture walks on each other's farms so the learning is very hands-on and social. Generally farmers coordinate grazing networks but more recently, they also receive help from organizations like cooperative extension which will provide some infrastructure and administration so these groups can have mailings [45]. A couple of Organic Valley staff, an organic educator, a few conservation agents, nonprofit representatives and Amish cheese company representatives were also interviewed to gather additional perspectives on the challenges and opportunities in terms of the future of organic, grazing and Amish dairy farming in the state). In total, 60 farmers participated including 18 organic farmers and 15 graziers (non-organic) (The managed grazing farm strategy is a combination of a very old technique involving heavy reliance on pasture [46] with more recent management knowledge aimed at managed intensive use of the pastures. Technically, we define a farmer as a managed grazer based on their reliance on pastures as a source of feed during the grazing season and by their movement of cows to a new paddock about once a week. However, many of the graziers in this sample rotated their cows more than that the minimum of about once a week.), 6 conventional farmers [All farmer participants (except the Amish) consented to have their interviews taped. Initial exploration revealed that it was culturally appropriate and respectful to not ask Amish farmers to tape record their interviews. Many other issues relating to farm decision making and viability were raised in the interviews themselves, and they were transcribed using open and closed coding. The two largest Amish settlements in the Kickapoo Valley are Hillsboro and Cashton. Roughly half of the Amish sample was selected from each of the settlements] and 25 Amish farmers from two settlements.

The interviews covered a number of topics relevant to farm decision making in the agro-ecological, economic, social, and religious/spiritual realms. Please refer to the online supplementary appendix for an interview guide. The flexible approach helped to advance conversation about controversial issues around the organic adoption decision. Bounded rationality emerged as a framework which enabled us to better understand the adoption choices because it offered a way to explain the diverse uses of distinct ideas and information sources. Statements were coded and organized into bounded rationality categories that could indicate ambiguity aversion, anchoring, extremizing, or some other form of

information satisficing such as principled satisficing. For example, when farmers were asked about the option of adopting organic farming, a primary response of ‘milk is milk’, was categorized as extremization. However, farmer statements were also considered within the broader construct of the larger interview. Sometimes, these reactionary statements need to be tempered by the full context of their farm choices, and other times such statements appeared to be a good reflection of where farmers were with respect to decision making about organics.

To help demonstrate our analysis of the role of bounded rationality behaviors in adoption decisions, we select and develop several farmer narratives with pseudonyms (We offer more narratives in the online supplementary appendix: four conventional, four graziers and six organic. More organic farmers were presented in part to capture the diversity of organic farmers especially related to the time of conversation). The narratives provide the reader with an account of the respondent’s farm size and system, social networks, information sources, and decision making approach. These narratives are presented in an on-line appendix and offer a sense of the diversity of perspectives and experiences. Additional farmer narratives, not explicitly mentioned in the next sections, are available there as well. These narratives provide a fuller context for our interpretation of the role and type of bounded rationality behavior than we can provide in the body of the article.

The rest of this article draws closely on these narratives to construct arguments about the ways in which bounded rationality behaviors and social networks shape organic adoption decisions. We start with organic farmers because they describe well the uncertainties encountered, the role social networks played, and some of the precipitant factors that induced them to give organic a try despite the uncertainties and information constraints they faced. For the non-organic farmers, we organize the discussion of the narratives around information access and use themes which vary from limited information access to systematic review of information. For the Amish in particular, it is more appropriate to discuss decision making on organic dairy adoption at the level of the community. For that discussion we draw on a comparison between two settlements, Cashton and Hillsboro, which will be briefly sketched below but developed in greater detail in another article [7]. In all of the cases, it is important to know that our interviews occurred at a time when the market structure was wide open for those wanting to convert to organic. Organic Valley was recruiting actively and so were other organic processors. Milk marketing was not constrained by contracts, and switching buyers was common among conventional growers.

4. Results and Discussion

4.1. In the Words of Organic Farmers—Overcoming Bounded Rationality Issues

Organic farmer narratives illustrate bounded rationality issues associated with adoption decisions on a continuum from ambiguity aversion to extremization. This continuum may be based on the farmer’s level of information satisficing and the context in which they confronted the adoption decision. Given the dearth of scientific literature and well-developed markets on some aspects of organic dairying [47] especially in its early years, farmers faced real uncertainty about certain relevant issues which address the question of discerning if organic dairy is a viable option for them. The issues were at the most basic level such as the availability of a market offering a better price for their milk or the accessibility of reliable supplies of organic grain and forage. However, in addition to these issues,

the organic farmers we interviewed also frequently discussed initial perceptions of organic that went beyond the basic features of the production, marketing, and management systems. Concerns like “milk is milk”, or that some organic farmers cheat, arose for some of them as well, even though they do not seem as germane to their potential success in the organic management system.

As we show below, social networks helped many of these farmers navigate the core management issues that directly affect the viability of an alternative farming system and other concerns which may not seem as pertinent. At the most basic level, these networks demonstrated that organic strategies could work on farms similar to those of the farmer in question, and provided a consistent source of information on how to manage the multiple changes required. For the less direct concerns (*i.e.*, concerns not related directly to production, marketing, and management), it seemed to have helped that organic systems were presented in ways by other farmers that did not reinforce the negative stereotypes of organic farming that many farmers held initially. Other factors which helped farmers transcend bounded rationality include their values, approach to learning, and an experimental nature. A context of economic or personal crisis at times served to reshape values and thus farmer information seeking strategies related to organics. Organic farmers like Matt Drake described their previous financial situation when he was conventional as “just trying to make ends meet,” whereas now they are in a much more comfortable situation. Kerry Martin emphasized the importance of a stable milk price for a beginning farmer when he stated “there’s no way that we could have gotten started financially with the conventional market...because organically you know pretty close to what you’re going to get for your milk, and that conventional roller coaster would be pretty hard when you first start.”

Each farmer narrative depicts different bounded rationality issues and the ways they confronted these issues. The organic farmer narratives also include the bounded rationality issues that they view as pivotal to constraining the adoption of organics by conventional and grazing farmers. For organic farmers, the narratives are presented in a way that roughly depicts the organic story in Wisconsin with the earliest adopters at one end of the spectrum in the 1980s who had very little available information and supporting social networks to the other end with relatively recent adopters who were still transitioning at the time of the interview (in 2007). These narratives lead into Section 4.2’s discussion of how conventional and grazier farmers access and process information in ways that may lead them to view organic systems in less than a comprehensive manner.

The Smiths, who started practicing organic around 1980, were among the very first organic dairy farmers in Wisconsin. They farmed about 10 years conventionally prior to practicing organic. Codified information on alternative agriculture especially organic farming was scarce, and extant knowledge was transferred farmer-to-farmer. The first major organic milk marketing buyer, Organic Valley (OV) (At its inception, Organic Valley was referred to as Coulee Regional Organic Produce Pool (CROPP) cooperative, started in 1988 about eight years after the Smiths began managing their farm organically. For the first eight years of organic production, the Smiths did not have access to a distinct marketing channel for organic milk. There were a scattered number of farmers managing their vegetable farms organically and also crop and livestock farmers who practiced “biological farming” as encouraged by Midwest BioAg, a company founded in 1984. Biological farming relies more on using minerals and rotations to manage the biology of the farm system rather than on the use of synthetic inputs, and it focuses especially on soil health (Midwest Bio Ag, a biological agriculture input supplier, is an information source that appeals to different kinds of farmers). As such, many of its principles intersect

very closely with organic management practices, and provided a strong platform for farmers considering the organic option. Managed grazing, another alternative farming practice which overlaps with organic, did not really take off until the mid-1990s [2]. In this context, the Smiths had to go further afield to find out about some of the main production practices that make organic dairy farming feasible. They reported making trips to Germany to learn organic methods, as well as having a conversation with a farmer in Minnesota who had been farming organically for 26 years. Mr. Smith also had experience with organic farming because his father was old enough that he managed their farm in effect using organic methods like most farmers prior to the 1950s.

The Smiths describe how their decision to go organic and eventually sell their milk to Organic Valley was primarily motivated by economic and ecological reasons. Even though their decision well preceded the organic price premium, the Smiths felt that they could make more money because organics was a low cost approach and that worked well. Indeed, Mr. Smith observed that organic “was the best thing for the cows, the best thing for the land, and it didn’t matter that [we] didn’t get any more for our milk.”

Local knowledge, learning by doing and tight social networks played a big role in the lives of early organic farmers as there was minimal support from academic researchers, extension agents, and industry professionals. The Smiths were one of the early adopters who helped to build up this social information infrastructure. As Mr. Smith stated, “It was a group of same-minded people...It was fun and exciting.” Some of the neighbors got into organic farming after the Smiths, and they had visitors come to their farm from long distances to learn about organic farming. As the Smiths explained, “We learned by our own mistakes and we learned from our neighbors... everybody was doing their own research.” They spoke of their ability to show that both significant yields and nutrient balance was possible with organic management. This may have helped others to address uncertainty about the feasibility of organics. Overall, learning by doing played a big role in their experience. And, it was clear that ambiguity aversion did not hold them back from experimenting with something new and uncertain. To the contrary, Mr. Smith seemed to enjoy the challenge of discovery as he had an inquisitive, experimental nature, which was illustrated when his wife reported one of his favorite statements, that he’d “quit farming when [he] got the far end of the field to produce as much as the front-end of the field.”

Ben and Dan Crank’s (two brothers) conversion to organic was primarily motivated by Ben’s health concerns that arose in 1988 when he was diagnosed with cancer. “I wanted to get away from using the chemicals and the harsh fertilizers and stuff like that.” Ben recalled that he sprayed harsh chemicals like 2 4-D without a shirt on when he was growing up, and felt that there was a connection between this pesticide exposure and his cancer. By 1993, Ben Crank had converted fully to organic, only five years after Organic Valley formed, and then both brothers were shipping their milk to Organic Valley by the early 2000s. Ben Crank recalled that there was not much information available about organics when he was getting started, but he also attended Midwest BioAg meetings, where he learned helpful techniques and principles.

Dan expressed how he experienced ambiguity aversion initially about organic as he wondered, “What is organic, and why is it better?” Dan Crank did not go organic until well after Ben. His brother, Ben, was able to eventually persuade Dan to adopt an organic system, perhaps by helping him to answer some fundamental questions with direct information. Ben commented that having other farmers

demonstrate that organic farming works is “what changes people’s minds. If you can [get] them to try things, then they can see some results,” and social networks are instrumental for making that happen especially when your brother is leading the way.

The Cranks and other organic dairy farmers offered substantive insights on the ambiguity aversion issues that farmers face and how they navigate through these challenges in the organic adoption choice. According to interview results, after farmers adjusted to the organic system, they had comparable and/or somewhat lowered production but even with lowered production, the stability and increased pay prices of organic milk usually more than compensated for any production losses. [Organic dairy research indicates that overall there are generally lower milk yields on organic dairy farms compared to conventional farms and similar yields compared to managed grazing farms with a few exceptions (e.g., [48–50]). For example, according to the 2005 Wisconsin ARMS data, organic dairy yields (11,791 lbs per year) were 30% less than conventional farmers (17,617 lbs per year). It is possible that part of the higher milk yields on conventional farms are in part due to higher concentrated feeds on these farms. As conventional farmers, the Cranks had been strongly focused on herd productivity as a goal, and reduced production levels were a major concern for them during the transition period as they are frequently for other organic farmers. “There was that pride with having that high producing herd; that’s what’s important.” The transition went well, and the Cranks stated “We are at 21,000 lb herd average...We have more livestock numbers than we ever had.” Indeed, for the region, the Cranks were at the upper end of both the organic and conventional productivity spectrum, and they may have achieved these high production levels because it remained a relatively high priority for them (Many organic farmers are not as focused on the goal of a high producing herd as a goal which is independent of other endeavors like profitability. However, some farmers like the Cranks are more interested in the goal of production than other organic farmers and may tailor their operation so they achieve that high production goal).

In addition to the production concerns that the Crank’s discussed, conventional farmers are often concerned about organic herd health issues and at times they may express extreme views about the risks. The Cranks stated that organic herd health management “was the big scare with many of my friends that have converted to organic... [they proclaimed] ‘you can’t do it. You can’t control mastitis.’” Some of this concern is real, because once you have an outbreak it can be challenging. At the same time, one organic farmer stated “the key to organics is prevention.” How rare and severe these events are remains poorly understood, but the Cranks, like other organic farmers, felt that their herd health improved markedly after they went organic and they stopped pushing the high production conventional model. Now that Ben Crank’s herd health has improved, he exclaimed that he gets a kick out of the fact that when his friends ask him about mastitis, he can respond, “I have virtually none. It is fun.”

Organic farmers acknowledged that overall herd health, milk production and feed provision can be significant challenges especially in the transition period and that organic may not be the best fit for certain farmers. Organic feed provision can be a preventing factor for farmers who will struggle based on land access or other production constraints to be feed and/or forage self-sufficient. Most organic farmers agreed that for farmers who do not raise their own feed, accessing affordable organic grain and forage could be a real challenge. Organic Valley has begun recently to help farmers source feed inputs and herd health consultation in order to alleviate concerns. This demonstrates that there can be

significant search costs for some farmers associated with organic management ([51]) involving sourcing organic feeds and information on herd health.

Organic farmers also pointed out how for the most part many conventional and grazing farmers do not consider the option deeply enough to even articulate specific concerns which would impact viability. As stated earlier, conventional farmers can have bounded rationality issues that go beyond these agronomic concerns. The Crank brothers said that some of the conventional farmers were envious about the high organic pay prices, but Ben always responded to this sentiment by stating, “the only one stopping you from getting that price is yourself...it’s a free world.” However, Ben went onto to say, “There are some that say, ‘I’ll quit farming before I go organic.’ They’ll say that to your face,” and so clearly they do not seem interested in learning from them about organics.

This lack of serious consideration of the pros and cons of organic *vs.* the farmers’ current management system may be reflected in the frequency of organic farmers who stated how issues such as social pressures may have a role in the decision making process. Ben Crank depicted the negative stigma against organic when he described how he overheard conventional farmers “talking about so and so and they are organic. Sometimes you feel like what a black person would have felt like in the 1930s and 1940s.” His wife said with a laugh, “maybe not quite that bad.” But Ben interjected, “but they are kind of shunning ya’...” The Smiths also talked about how people laughed at them, and insinuated that they were going back in time by managing their farm organically.

Matt Drake, who converted in the early 2000s, said he had a lot of initial hesitations based on negative stereotypes associated with organics which depicted “guys in the ponytails and the flip flops and the ripped shorts.” Initially, he was not comfortable with socializing with organic people as he stated when “I heard the O word, [then]...I joined the other table...” But, Matt warmed up to the idea of organic farming by learning about biological farming from Midwest Bio Ag. He said there is less baggage associated with “biological farming” than with organic. For him, it was an “an easy sell going from conventional to biological.” Then once Matt was biological for a while, he joined the organic table at the Midwest Bio Ag meetings and “got a wealth of information.” In fact, “middle of the road” management systems, such as biological farming and rotational grazing appear to have played a key role in helping many dairy farmers in our interviews consider organic agriculture.

The most recent converter to organic dairying in the narratives is the Sert family. Their account includes legitimate concerns with organic relative to their previous management system, but it also highlights the importance of issues which may not be as pertinent to potential viability. The influence of social networks can encourage or discourage organic dairy adoption. Understandably, the Serts were reluctant to go organic because they were deeply invested in a conventional dairy system with modern technology and at over 200 cows were operating at a much larger size than most organic farm operations. Moreover, they had no experience managing their cows on pasture. But eventually, they decided that they had had enough of the low and volatile prices and some of the other demands of the high production conventional management structure. As Jerry stated, they decided that some of the conventional stuff “wasn’t so good. It [involves] shooting the cows all the time (injecting rBST and pushing high energy feeds)... I was shipping the most milk I ever shipped and I wasn’t making any money...All you are doing is flooding the market and the farmers are not making any money with it.” Indeed, the Serts, like many recent organic adopters, report being mostly attracted to the organic price premium and stability as well as to the potential ecological benefits of organic farming.

Although the Serts had initial ambiguity concerns about production levels under organic management, they also expressed concerns that revolved around issues which were not relevant to potential viability that were more on the extremization end of the bounded rationality spectrum. Tom kept bringing up the organic possibility to his wife, and the conversation would often gravitate and get stuck on the idea if organic milk was really better than conventional milk. Tom responded to his wife's concern by stating (paraphrased) "Let's have our organic friends over and ask them about it" to try and resolve the issue. Tom's wife "loved everything they had to say and she said the final question is, 'Is your milk better than ours?'" When their organic friends said that organic milk was not any better, Laura felt okay about adopting organic practices. This sentiment of "milk is milk" may reflect the widespread idea among farmers that all milk is wholesome and the associated negative perceptions about marketing organic milk as superior.

The Serts were able to navigate their bounded rationality issues because of the social infrastructure and knowledge exchange that the Smiths and other earlier farmers helped to create. Many conventional farmers who exhibit extremization do not get to the stage in reflective conversations that the Serts did with organic farmers/friends. Some farmers like the Serts find that they have to be willing to move beyond their conventional-oriented networks and friends and create new bonds with other farmers who were practicing organic dairy [21] partly because of the negative attitudes about organics in conventional circles. Farming friends played a pivotal role in the Serts' adoption decision process, and their encouragement was helpful in getting them through the challenging transition process especially given the intensity and size of their conventional operation. The Serts report being thrilled to be participating in organic social networks and to be separated from the negativity about organics that is prevalent within many conventional farming networks.

Organic farmers consistently stated that other organic farmers as well as social networks created by organizations like Organic Valley and Midwest BioAg have been helpful for information exchange and encouragement. There were definitely "keystone" organic farmers who had influenced a number of other farmers to go organic in the interviews. For example, one farmer, Devin Dooley, thought that Organic Valley focused on recruiting him to convert to organics because he was particularly well respected in the conventional community and his family had received production related awards in the past. If so, this is an example of how Organic Valley understood some of the direct challenges and bounded rationality issues associated with adoption decisions in a practical way and used the power of farmer networking. In fact, they rely on farmer members for a lot of their recruiting, as one Organic Valley representative stated if "[farmers] see it themselves or hear it from other farmers" than "that is when the light bulb goes on because they trust other dairy farmers more than any (other) industry person."

4.2. Information Satisficing among Non-Organic Farmers

In this section, we organize the discussion around information satisficing themes that conventional and grazing farmers expressed as well as the continuum of bounded rationality issues that the organic farmers discussed above. Farmers who appeared ambiguity averse focused on the technical challenges with the conversion to organic dairy [52] and were able to articulate those issues at some level. In contrast, farmers who exhibited bounded rationality at a more extreme level may not have considered

organic dairy enough to even articulate concrete reasons for not adopting. Sometimes these reasons were based on narrowly defined views such as “milk is milk”.

Our presentation of the bounded rationality issues associated with non-adopters is not clearly divided into a clear linear progression along a spectrum, in part because some farmers exhibited multiple levels of bounded rationality at different times in the same interview. This made it difficult to categorize farmers. Instead, we use the spectrum as a way to illustrate the different types of bounded rationality issues farmers expressed in their response to the organic dairy adoption question.

We highlight four information-access and use themes that non-organic farmers exhibited, and each of them reflects multiple levels of information satisficing. The first theme illustrates how a community can put explicit limits on its members' information access and processing because of how they combine commonly held values and bounded rationality issues. By comparing two Amish communities, we see meaningful differences in how information satisficing behavior can play out. Next, a common way that people information satisfice is by getting information for general background purposes only. This can be demonstrated in a somewhat open way where the decision maker has neutral views of other production practices, but does not explore these options enough to learn very much about them. Information satisficing can also be expressed at a more extreme level where negative ideas around issues that are not relevant to potential viability of the organic system persist because farmers are not acquiring much outside information.

A third information theme is illustrated by farmers who may actually get a lot of information, but their values lead them to channel their efforts towards a clear and focused end goal like high production using conventional methods. This singular focus can in turn cause farmers to dismiss information about organics especially if they are satisfied with their current management system. At some level, all decision makers exhibited this kind of behavior when it comes to paths not taken. We cannot know everything about all of the alternatives. However, at an extreme level, this lack of information gathering could be typified as “anchoring” or extremetizing especially when farmers focus almost exclusively on issues which are not relevant to the potential viability of the alternative management systems and do not provide meaningful contrasts with their current approach. Finally, some farmers processed information in a systems-based way but have distinct reasons why they choose not to adopt organic dairy. These farmers were not information satisficing until after they appeared to have acquired a lot of information about the system, which in our view suggested that bounded rationality was at most secondary in their decision not to adopt organic methods.

4.2.1. Explicit and Implicit Information Limits Based on Community Values

Social networks can cause decision-makers to place explicit and/or implicit limits on information access and use, and the Amish provide a good example of this phenomenon in the organic dairy adoption context. The combination of strict traditional values and bounded rationality frameworks helps to explain how the Amish constrain gathering and processing of information related to organics at the community level which then constrains individual farmers as members of that community.

It is worth reiterating the assertion that in many ways organic farming seemed as if it would be an especially good fit for the Amish, because they operate smaller farms which use pasture as a source of feed. They also prefer labor intensive strategies over technology intensive ones because working together

on the farm is viewed as pivotal to actualizing family and community values on a day-in-day-out basis. However, most Amish farmers in this area did not practice organic dairy, and in percentage terms there were only a few more organic farmers proportionally captured in this sample than there were amongst the non-Amish in the same region.

A slower than expected adoption rate of organic amongst the Amish may be explained by principled satisficing. Principled satisficing is a bounded rationality behavior under which decision makers may acquire and use less information than they would under the usual assumptions of rational utility maximization for distinct value-based reasons [10,44]. In this context, decision makers, “satisfice” or “optimize” with the information they know and understand [53,54], and may even actively resist knowledge acquisition. (Satisficing may in part explain why decision-makers stop their thinking or information gathering early on, based on an attitude that continued searching “seems like a waste of time”[55]) In the case of the Amish, bi-annually they consider limited reforms to the *Ordnung* (Ordinance), or church rules, which are an expression of the values and guiding principles of each Amish community. These rules tend to change very slowly over the years [56] as “changes are clearly not encouraged, vocalized or rewarded in Amish society” [57]. As part of the *Ordnung*, intellectual pursuits are not encouraged as they could lead one to become worldly and proud. Hand labor is viewed as ideal Christian work, and that is reflected in the explicit limit on formal schooling beyond the 8th grade [58]. Likewise, Amish community members are also generally not encouraged to attend large conferences and workshops with outsiders in order to avoid worldly entanglements, which in turn would make it difficult to learn about organics through social networks. As a result, efforts to gather information about alternative farming practices are generally not encouraged, and may be explicitly or implicitly discouraged. This asocial constraint functions as a form of principled satisficing, especially for a change as information intensive as a full system switch to organic dairying.

Recent management decisions of an Amish cooperative, known as Old Country Cheese co-op, also illustrated how principled satisficing at an organizational level constrained individual Amish farmers in Cashton and Hillsboro from making a fully informed decision around organic dairy. Old Country Cheese was started in 1982 by a group of Cashton Amish who were committed because of adherence to the local *Ordnung* to making a market for canned milk, *i.e.*, non-refrigerated milk collected in cans from Amish farms (Some other settlements in eastern states adopted bulk tanks as early as 1969 [59]). In fact, in the study region, Old Country Cheese was the only marketing outlet for canned milk as all other milk buyers in the area required farmers to acquire a bulk tank. As a result, at the time of the survey, Old Country Cheese had monopsony control over major decisions around establishing and maintaining an organic line both at the community and the individual level, and they had not kept a consistent commitment to the organic line in previous years. This lack of consistency was partly due to the negative attitudes about organic among some Cashton Amish elders who had influence on the board.

Organic dairy was viewed as a potential threat to Amish values among some leaders in the Cashton Amish church. Based on the notion the Amish have about the critical importance of unity or “being one body” in a scriptural sense, these elders worried that some members of the community would receive higher pay prices for organic milk than the non-adopters. This differential could then translate into a sense that not all community members were being treated equally. In fact, some of the Cashton elders and farmers stated the common refrain that “milk is milk”, but often it seemed based on an intention to avoid favoring one co-op/community member over another. Value-based hesitations

specific to allowing a new practice which might divide the community seemed to underlie principled satisficing type of behavior with respect to organic dairy.

In general, the Hillsboro community held more positive views about organic and as such show that the interplay between Amish values and bounded rationality depended on the context of the community. In Hillsboro, some of the early settlers to the community wanted to avoid pesticides, and they had a positive view overall of organic from their previous farming experiences prior to migrating to Wisconsin. Due to the close social networks within their community, organic agriculture spread more quickly than it might have in the non-Amish world. Moreover, in the Hillsboro community, local norms were not as strong as they were in Cashton in dissuading farmers from acquiring information related to organics and other alternative practices like managed grazing. Yet, the Hillsboro farmers understandably expressed ambiguity concerns with respect to the benefits of going organic when they noted that the local cooperative, the Cashton-controlled one, had not been totally committed to maintaining that product line. Given the importance of values and social networks in the organic adoption process for many other non-Amish farmers described in Section 4.1, the contrasting experiences of these two Amish communities make it clear that influences at the community level can also be important in shaping the context for adoption decisions. Principled satisficing may also apply to the broader landscape though perhaps less starkly than within the confines of these two Amish settlements [7]. For example, the emphasis on a high producing herd could be viewed as a value in a sense at the community and individual level which influenced information satisficing about an alternative production system like organic.

4.2.2. Open to General Background Information but Little More

Many non-adopters seemed to rely mostly on an information-gathering strategy where they read and interacted with other farmers for general background, but then did not seriously consider alternative management-systems. This particular kind of information satisficing could lead to more or less extreme status quo bounded rationality behaviors depending on the personality and the context of the situation. The theme of getting information mainly for general background is illustrated with two narratives, those of Randy Rod and Andy Son. Part of the reason for the frequent expression of this information access theme is that farmers tended to have values which were similar to the Amish in that they value working with their hands and getting things “done” on their farm more than getting information about different possibilities.

Consider first Randy Rod, who was relatively open minded, gathered information widely, but did not openly wrestle with systems level changes. As a mid-sized conventional producer (about 70 cows), Randy farmed pretty much like his Dad but did experiment with reducing his pesticide and fertilizer usage because this saved him money and also had environmental benefits. Similar to several other conventional farmers, he would review alternative strategies somewhat objectively at a distance, but choose not to immerse himself in details. Randy Rod didn't express any kind of strong negative attitudes against organic but also could not explain in very much detail why it would not work for him. (For example, Randy Rod doesn't grow his own feed which could be an extra challenge for organic but he didn't get into that level of detail in the interview). When asked if he had thought about other

strategies like going organic or using pastures more intensively or getting bigger, he stated that his current approach:

“works so you kind of stick with it...and the thing is that I would hate to upset the apple cart, you go with some other strategy and you say hey this ain't working; now you've lost time and money fiddling with it, and to go back is going be costly too... If it's not broke, don't fix it.”

The apple cart for Randy was in a sense the status quo. This statement reflects a common and sensible attitude among many farmers that what is right for one person may not be right for another. Farmers like Randy Rod stated that they were doing fine with where they were at so they did not see any need for change. In his view, as long as different strategies worked for different farmers, he was neutral and open minded about all of the strategies; he just felt that his current strategy worked for him so why bother to change. In all fairness, it was hard to dispute his claim, considering that he did not work off of the farm and neither did his wife. They appeared to have a farming strategy that kept them economically afloat in challenging times.

Andy Son illustrates a more extreme version of limited information gathering, in which he did not generally consider outside information and expressed feelings of social isolation. He had only 35 cows and used minimal modern technology. He called his farming system ‘high tech Amish’ as a way of slighting his relatively small-scale conventional operation.

Andy seemed to view himself as a victim of changing milk and fuel prices, environmental regulations and isolated social conditions, and it was clear that he did not get a lot of outside information. He seemed to take a very passive role in gathering and assessing the information. He was frustrated with his situation and expressed a victim mentality. However, it didn't seem that he had actively considered other options like organic that were garnering higher and steadier prices for operators whose farms were much like his in size, structure, and basic management practices prior to their organic conversion. Andy did not exude Randy's attitude that conventional and organic were both fine options that fit the needs of different kinds of producers. Instead, he had more distinctive opinions about both organic and larger conventional production systems. On the one hand, Andy Son's statements seemed to reflect jealousy that organic farmers got a higher pay price, as he felt like organic farmers were getting paid more to do the same thing he was, in other words a “milk is milk” sentiment. Along these same lines, he was skeptical that organic farmers were complying with the organic rules. On the other end of the continuum, he also was disdainful of larger conventional systems who “spray, spray, spray”. Andy Son seemed to be representative of the economic and quality of life dissatisfaction widely expressed by many small-scale conventional farmers at that time in the aforementioned large-scale survey [2]. He lived with his parents, and his mother worked outside the home, perhaps providing the majority of the family earnings. It seems as if he felt isolated amongst larger scale conventional farmers, and he felt that he was the last young farmer amongst an aging and disappearing farm population.

4.2.3. Using Information Selectively and Potentially Anchoring on Narrow Goals

Some farmers avidly pursue information to guide their farm management decision making, but seemed highly focused on narrow objectives. Larry Wagner, who milked over 300 cows in a conventional confinement system, exemplifies this type. His primary focus was on increasing herd productivity

which is a commonly understood way that dairy farmers deal with price-cost pressures to improve returns per cow. In turn, they may get as much information as possible to support that goal. In that regard, Larry was very progressive in terms of getting information tied to extension and the university, and was deeply embedded in a variety of networks that focused on improving herd productivity within conventional confinement systems. Larry focused on production over other dimensions of the farm management system.

Larry, at times, cited purely structural issues as to why it would not make sense for him to consider organic because he already had invested so much in a high input system. However, he also discussed issues which did not seem pertinent to the potential viability of an organic system. These issues go beyond structural reasons and could be categorized more as anchoring and extremization. Larry Wagner said that organic “milk isn’t any better” than conventional milk. He stated there may be an issue with chemicals on fresh produce but with “the way a cow purifies the milk, I don’t think that it’s any better. What really gets me is [the] organic producer will come out and say in the paper that their product is so much better. There’s no proof to that.” So Larry seemed to imply that organic producers and consumers may be overly focused on the risks of pesticides. Larry expressed similar sentiments about cheating as Andy Son as he thought a number of organic farmers actually use synthetic chemicals and hormones not allowed within organic standards; so he concluded, “I’m not going to lie or cheat.” The point is that ideas of all milk being the same (“milk is milk”) and organic farmers cheating are arguably not relevant to if organic farming is the best fit for a conventional farmer considering profitability and other objective criteria.

Nonetheless, Larry seemed content with his current management system. It is arguably true that his focus on productivity was highly profitable, and as such provided support for this particular case. In this way, Larry typifies evidence that many larger scale confinement farmers are quite content with their farming and quality of life situation [60]. The same conclusion might not be true for other producers who focus on narrow aspects of their farming approach. For example, the Serts, who previously operated with a high herd productivity focus, decided that this approach was not the best for them and so adopted an organic system.

4.2.4. Acquiring Information Systematically but still not Going Organic

Some farmers appeared to have examined the available information on alternative systems but had chosen not to convert to organic. These farmers gave specific ambiguity aversion reasons related to herd health, organic feed access, and/or other production-related reasons. Many of the farmers who exhibited this systems based approach were managed graziers, and in part they tended to know more about organics because their emphasis on pastures creates overlapping social networks with organic producers. For example, one managed grazer, Paul Flecker, liked to “keep experimenting” with different farm management techniques. He went to a lot of pasture walks and worked with extension folks closely. Paul had the ability to encounter obstacles and gather information with respect to alternative management types, and he gave reasoned answers related to conversion challenges for his decision not to adopt organic. One of his main reasons for not going organic was that he was not going to be in dairy long enough to make the transition period worth it. He was hesitant to convert given the short time horizon he envisioned for himself as a dairy farmer. He acknowledged that with organic he

would have to think harder about weed and herd management. As Paul said, “It can also be so easy to let the weeds take over. I don’t disparage the people that do it and do it successfully. They’ve got it going on.” He also stated that organic dairy “presents some challenges as far as herd health...Those challenges can be overcome because obviously there are a lot of people doing organic dairy. But I just haven’t.” Overall, Paul was very pleased with his managed grazing system and seemed to be achieving his goals.

Paul’s information satisficing with respect to organics was at a much more advanced level than many other farmers as he seemed to interact readily with organic farmers and commended them for their skills in managing weeds and herd health. All decision-makers’ information satisfice at some level given the constraints on time and human ability to process information. One could argue that Paul had good reason to information satisfice at a certain level about organics given his short expected tenure as a dairy farmer.

Other informed graziers also exhibited ambiguity aversion about organic feed sourcing as it could be challenging to secure reliable organic feed supplies at good prices. For some of the managed graziers, they had preferences for pasture management over crop production and thus purchased all of their own grains rather than raising it themselves. In that sense, they were especially vulnerable to challenges accessing affordable organic feeds if they were to convert to organic production. A few intensive grazing farmers also had some sophisticated critiques with regards to managing invasive species without some minimal use of herbicides which would not be acceptable under organic standards. One of the managed grazing farmers in the sample changed his mind about the relevant importance of these constraints as he decided to adopt organic practices a couple of years after the interview illustrating that these uncertainties were not necessarily permanent constraints on adoption especially when bounded rationality behaviors are less extreme or almost non-existent.

5. Conclusions

Bounded rationality appears to play a significant role in shaping adoption decisions around organic dairy farming in Wisconsin. It is not always a binding constraint, and it may decline as information and knowledge spread, but it can be a major barrier for farmers to overcome in the early stages of a successful alternative management system or technology. Bounded rationality can also be an ongoing constraint if farmers information satisfice in ways that might prevent them from taking viable alternatives seriously. Organic farmers shared inspiring adoption histories and thought that organic dairy was a viable option that other similar farmers should consider. The historical evolution of their adoption experiences also shows how information challenges diminished as supporting social networks were built and information exchange opportunities expanded.

Overall, organic dairy farmers faced many of the same information constraints and social pressures as conventional farmers yet they overcame these issues through a range of motivations to consider organic dairy and their willingness to seek out information and social networks around organic. Strong economic, ecological and health related motivations inspired the farmers to consider other alternatives.

The preferences and bounded rationality dynamics of an individual’s adoption decision may shift through time. In addition to the farmers’ existing farm set up, bounded rationality and the farmer’s personality and values/preferences, their context including personal crises and social factors were also

important in determining adoption decisions. As organic pioneers, the Smiths faced the most information challenges, with no real price incentive for years. In contrast, as we saw in the case of the Serts, who were embedded in a conventional confinement model, it took a significant price premium combined with their challenging economic situation as well as an encouraging group of friends to induce them to adopt organics. Ben Crank decided to stop using chemicals after he was diagnosed with cancer, and his brother followed once he saw that the organic system worked for his brother. Matt, like Devin and the Cranks, had a shift in his preferences towards organics related to economics and experiencing the benefits of biological farming. Some organic farmers expressed that they also originally had hesitations to convert to organic which involved anchoring and extremetization just like some of the conventional farmers. Prior to the cancer diagnoses, the Cranks were on a high production mindset and thus were probably not seriously considering alternatives like organic. The Serts exhibited anchoring on all milk being the same as a reason to not convert to organic.

Social networks were particularly important for enabling shifts in preferences and bounded rationality thinking or in confirming current strategies. A number of the organic farmers highlighted the exchange of information and camaraderie that they have experienced in their farm networks. Knowledgeable friends and relatives can determine how open a farmer may be to alternative management systems. The Sert's friends convinced them to go organic and they were excited and joked about the "organic clique" of farmers who helped each other out and exchanged information about farming. There had also been some peer pressure inhibiting the spread of organics which could serve as a challenge for some farmers to consider these systems.

Most conventional farmers in this area appeared more likely to make changes at the margin regarding management practices rather than to consider information about other alternatives which may be appropriate for them. They may be getting information and talking to other farmers, but it was mainly for general background instead of as a means to challenge the way they already do things as demonstrated by Andy Son and Randy Rod. There seemed to be an attitude amongst farmers that they just need to make sure the basic farm management demands are covered so they do not need to keep themselves open to different farm management possibilities. This approach was not necessarily reflective of their financial state and contentment with their quality of life as seen with Andy Son, as he was not satisfied with his current situation.

As discussed above, information satisficing can dissuade farmers from fully considering organic dairy or any new system as a viable option. Andy Son revealed that he hadn't thought much about the details of organic beyond the possibility of cheating and that organic milk was not really any different and thus it would seem as if he had anchored/extremetized on these issues. Neither of these issues were factors which would have much impact on Andy's success as an organic dairy farmer. Larry had acquired and utilized a lot of information but this was channeled mainly towards a high productivity goal which kept him invested in a high-input conventional form of production. In that sense, the "fixation on productivity" evoked by Larry Wagner may be a form of anchoring that dissuades conventional operators from analyzing the benefits of organic management at a systems level. And it was also clear that he held strong negative emotions about organic that cannot be fully explained by this logic. Like Andy, Larry also exhibited extremetization about some farmers being cheaters and he also was focused on how all "milk is milk".

Farmers who were more likely to access and consider information in a systems-based way were less likely to have more extreme bounded rationality issues with regards to systems like organic. Paul Flecker, and other managed graziers, seemed committed and proactive about information seeking on a broader range of alternatives than Larry was with his production focus. Farmers like, Paul, had less reservations about organic, and their hesitations were more closely tied to ambiguity aversion. Also, he was concerned about issues like the three year transition period which many conventional farmers were not even aware of because they had not acquired enough information on organics to know about it. Farmers who are ambiguity averse may be focused on the technical challenges with organics and necessary changes with conversion [52]. Paul and other managed graziers also had preferences for managing pasture and so may not have wanted to venture into crop production. Some organic farmers say that on-farm crop production is necessary given the challenges of accessing affordable organic grains and forages.

In summary, the complexities of information access and processing related to organic adoption suggests the need for a multifaceted approach to understanding the ways in which bounded rationality contributes to farm system decisions. This article only highlights a few bounded rationality issues and information access themes; there are others that could be explored around these ideas. A bounded rationality framework mixed with values and preferences could be used to gain insights into complex farm decision making as was briefly depicted with the Amish communities case study and is discussed further in Brock and Barham, *Forthcoming* ([7]). Values can also evolve over time as we saw in dramatic ways in some of the organic farmer stories like Ben Crank's diagnosis of cancer. One could explore what common values farmers hold, and how these values may vary amongst and within farm management systems. These frameworks could be refined and honed for different complex systems based decisions outside of farming. Finally, we hope that this view of farm decision making can help policy makers and educators respect and begin to understand the complex nature of adoption decisions and the role that information use themes play in decision making especially for emerging, alternative farming systems. Information may need to be tailored to the specific needs of different communities and types of decision-makers. For example, perhaps fuller discussions are needed around the "milk is milk" idea so that farmers might think more reflectively about what lies behind these extreme statements and have a more open and engaging dialogue similar to the one reported between the Serts and their organic farmer friends. Those types of discussions would allow farmers to more carefully consider new options, such as organic dairy farming, with a deeper view of the pros and cons. And in so doing, remain open to the prospect of discovering ways to improve their farm performance and achieve family goals in the realms that matter most to them.

Acknowledgments

We are grateful to the dairy farmers who provided invaluable information on decision making and Anthony Austin who spent many hours assisting in transcription of data. Some fraction of the financial support for this research was provided by Sustainable Agriculture Research & Education (a division of the USDA) and through a Grazing Lands Conservation Initiative (GLCI) Grant and by an NSF grant on spatial patterns of technology adoption.

Institutional Review Board/Farmer Anonymity

This research was approved by the Institutional Review Board of the University of Wisconsin-Madison. As described in the methods section, the farmers' identities are fully protected. If the farmer was described in a narrative, they were given a pseudonym.

Conflicts of Interest

The authors declare no conflict of interest.

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