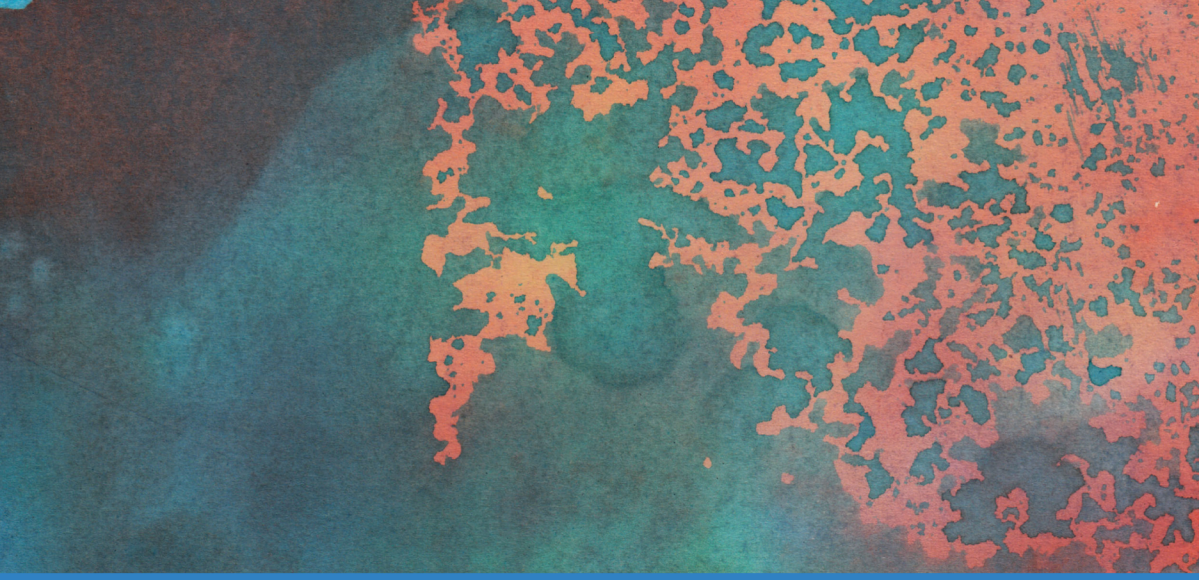

Routledge Studies in Anthropology

CULTURAL MODELS OF NATURE

PRIMARY FOOD PRODUCERS AND CLIMATE CHANGE

Edited by
Giovanni Bennardo

Cultural Models of Nature

Drawing on the ethnographic experience of the contributors, this volume explores the Cultural Models of Nature found in a range of food-producing communities located in climate-change affected areas. These Cultural Models represent specific organizations of the etic categories underlying the concept of Nature (i.e., plants, animals, the physical environment, the weather, humans, and the supernatural). The adoption of a common methodology across the research projects allows the drawing of meaningful cross-cultural comparisons between these communities. The research will be of interest to scholars and policymakers actively involved in research and solution-providing in the climate-change arena.

Giovanni Bennardo is Presidential Research Professor in the Department of Anthropology and Cognitive Studies and also works at the Institute for the Study of the Environment, Sustainability and Energy at Northern Illinois University, USA.

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Routledge
Taylor & Francis Group
LONDON AND NEW YORK

First published 2019
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
52 Vanderbilt Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record has been requested for this book

ISBN: 978-0-8153-5658-5 (hbk)
ISBN: 978-1-351-12790-5 (ebk)

Typeset in Sabon
by Newgen Publishing UK

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Introduction

Cultural Models of Nature of primary food producers in communities affected by climate change

Giovanni Bennardo

On March 12–14, 2015, at the Biblioteca Frinzi (Frinzi Library) of the University of Verona, Italy, a workshop was held entitled 'Local Knowledge and Climate Change: Fieldwork Experiences.' The workshop was organized by Giovanni Bennardo (Northern Illinois University) and Anna Paini (University of Verona) and was sponsored by the National Science Foundation (NSF) and by the Dipartimento Culture and Civiltà and the Biblioteca Frinzi, both at University of Verona. Twelve scholars from American, European, and Chinese institutions participated in the workshop. They reported on extensive fieldwork conducted in communities in twelve countries on five continents (see Figure I.1): China, Ecuador, Japan, Kenya, Italy, Lithuania, Namibia, Pakistan, the Philippines, Poland, the Kingdom of Tonga (Polynesia), and the United States.[1] The workshop participants pursued deeper understandings of the cultural models of Nature held in these communities.

The workshop represents a milestone for the project, 'Cultural Models of Nature Across Cultures: Space, Causality, and Primary Food Producers.' This project started in September 2011 with a first NSF-sponsored three-day workshop the results of which were published as a working paper of the ESE Institute at Northern Illinois University and titled *Proceedings of Workshop: Cultural Models of Nature and the Environment: Self, Space, and Causality* (Bennardo, 2012). In June 2013, the resulting research proposal was funded by NSF (BCS 1330637). During summer 2014,[2] the scholars involved in the project conducted research at their respective field sites and, once back at their institutions, systematically processed and analyzed the data. This volume contains the results of the analyses conducted by nine of the twelve scholars who presented and discussed their research in the workshop at the University of Verona. It also contains the results of the analyses of two additional scholars who had not completed their work yet—in Ethiopia and in Amazonian Brazil—when the workshop was held.

The NSF-sponsored research project

The NSF-sponsored research project entitled 'Cultural Models of Nature Across Cultures: Space, Causality, and Primary Food Producers' is

DOI: 10.4324/9781351127905-1

Figure I.1 Field sites.

investigating cultural models of Nature across several cultures held by populations/communities of primary food producers such as farmers, fishermen, herders, and hunter-gatherers all affected by climate change. I capitalize *Nature* when the word refers to the cultural model we are investigating. I want to draw attention to the fact that capitalized *Nature* and lower case *nature* have two distinct meanings. The latter is typically intended to mean a specific part and type of the environment (e.g., woods, rivers, mountains, etc.) or some biologically given aspect of existence (i.e., instinct), while the former may include all that exists. Capitalized *Nature* then is a concept that is close to what is traditional called a 'worldview.'

Evidence suggests that cultural models of Nature influence environmental actions in ways not necessarily predicted by more traditional ecological models (see Kempton, Boster, and Hartley, 1995; Atran and Medin, 2008). While traditional ecological knowledge typically tends to freeze knowledge in the past, cultural models affect attention, observation, reasoning, and understanding and therefore engage with the current situation.

Climate change is one of the most challenging issues we collectively face insofar as it threatens the survival of our species. Before long, extensive action will have to be implemented worldwide to minimize its potential and disastrous effects (such actions have already been initiated in the last two decades). The populations keenly aware of and most at risk from the effects of climate change are obviously those whose livelihood depends on daily contact with the changing physical environment. Primary food producers best represent these populations: farmers, fishermen, herders, and hunter-gatherers. Of course all humans are at risk, and we will eventually be obliged to change our behavior to make our presence on the planet sustainable (see Moran, 2006, 2010). However, primary food producers' daily and close contact with the physical environment makes them most directly

affected by climate change. Besides, they will likely be asked to implement whatever new and/or radical remedial policies are proposed. Before carrying out any strategies directly impacting these populations, it would be prudent to understand their cultural models of Nature.

All primary food producers hold views—mostly out-of-awareness (Kempton, 2001), as most of our knowledge is (e.g., knowledge about language)—about nature and the physical environment, particularly in terms of how they are affected by and must adapt to changes in the latter. Such out-of-awareness knowledge structures are typically called cultural models (Holland and Quinn, 1987).

One of the most widely accepted ways of understanding the organization of knowledge in the mind is that of mental models (Johnson-Laird, 1980, 1999). When a mental model comes to be shared within a community, then one calls it a 'cultural model' (Holland and Quinn, 1987; D'Andrade, 1989; Shore, 1996; Strauss and Quinn, 1997; Quinn, 2005; Kronenfeld, 2008; Bennardo, 2009; Bennardo and De Munck, 2014). These out-of-awareness mental structures are used to make deductions about the world, to explain relationships in a causal fashion, and to construct and interpret representations from simple perceptual inputs to highly complex information. Importantly, they can also motivate behavior (D'Andrade and Strauss, 1992; Kempton, Boster, and Hartley, 1995; Atran and Medin, 2008), or more precisely, contribute saliently to the generation of behavior. In other words, we use cultural models to make sense of the world around us and at the same time they provide the basis out of which we plan our behavior (see also Paolisso, 2002).

A significant characteristic of this research project is the adoption of Cultural Models Theory and the use of the logically resulting methodology—for data collection and for data analysis—by all the participating scholars. One of the advantages of this fundamental feature of the project that generated the results reported in this volume is that the results for each community is comparable across all the investigated communities, that is, cultures.

Cultural Models Theory

We chose to look into the local knowledge of primary food producers affected by climate change through the lens of Cultural Models Theory. This theory allows us to address culture as knowledge, which is exactly the focus of our research. A fundamental assumption of Cultural Models Theory is that the locus of culture is the mind of the individual (Goodenough, 1957). A mind consists of operations and processes that work with a set of representations. Mental representations have content and, at the same time, they realize and induce processes. A mental representation, that is, a mental model, is a model of a part of perceived reality and as such it is a reduction of the

part of the world it represents. These models/reductions by necessity retain aspects of the structures they represent (Johnson-Laird, 1980, 1983, 1999). Therefore, mental models are structured. Consequently, they are made out of units that have relationships to each other. These relationships vary in type, for example, sequential, taxonomic, or causal.

Another fundamental property of mental models is that they consist of core and periphery parts (Minsky, 1975). The periphery comes into contact with contexts that could change its value/s, while the core is less prone to change. If context does not provide sufficient input to set a new value of the periphery, then a default (previously obtained) value is assigned. Mental models are typically out-of-awareness and may participate in the construction of larger models via nesting. When a mental model is assumed to be held by members of a community, then it is a cultural model (D'Andrade, 1989, 1995; Strauss and Quinn, 1997; Bennardo and Kronenfeld, 2011). To be considered 'cultural,' models also need to be socially transmitted and carry some socially coercive force (Gatewood, 2014). From these assumptions, we can make a few deductions about cultural models:

- Cultural models are mostly out-of-awareness because mental models typically are;
- There are minimally two types of cultural models: (a) foundational, which are simpler and based on ontological domains (e.g., space, time, relationship, etc.), and (b) molar, which are complex and may include foundational ones and knowledge from other domains (Bennardo and de Munck, 2014);
- Individual variation in the construction of cultural models is a consequence of their nature and how they interact with context (ontogenesis);
- Cultural variation within communities is also a result of the nature of cultural models (their core and periphery structure) and how they interact with contexts, that is, group and/or individual experiences;
- A cultural model is considered the unit of investigation of culture.

Cultural Models Theory and methodology

Adopting Cultural Models Theory as a way of conceiving culture leads to a specific methodological path that requires the acquisition of three types of data: ethnographic, linguistic, and cognitive (see Figure I.2, also Bennardo and de Munck, 2014). All the authors in this volume have extensive ethnographic knowledge and ongoing experience of the community they have investigated. This knowledge has been supplemented by further participant-observation, nature walks, and open-ended interviews focusing on cultivated fields, subsistence gatherings areas, pastures or marine habitats depending on the type of food production, for example, horticulture, herding, fishing. During these walks or outings, the researcher conducts informal, thematically driven interviews. Through this activity, scholars focused the

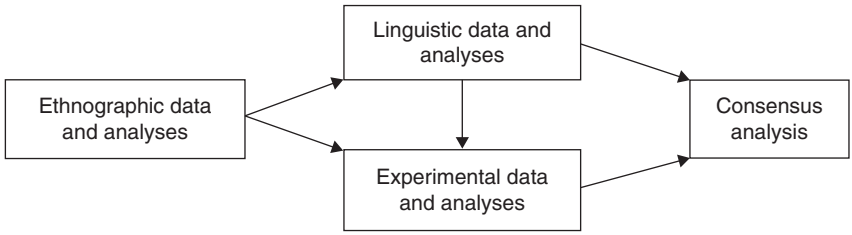

Figure I.2 Methodological trajectory (Bennardo and de Munck).

ethnographic lens on the topic at hand while eliciting language related to the natural environment. Ethnographic knowledge is considered a necessary prerequisite to the other methodological steps and an essential part of the data-analysis process.

Gathering linguistic data is justified by the common understanding that language represents the 'highway' into the mind (see Strauss and Quinn, 1997). Semi-structured interviews are administered to a sample of the community. The major justification for such a move is rooted in the nature of cultural models that by definition are shared within the members of a community. Then, asking the same questions to the chosen sample should make likely the elicitation of the model. The interviews are about daily food-producing activities because talking about them is supposed to activate the interviewee's cultural model of Nature as they explain the activities and their beliefs about them (see Bennardo, 2012: 126, and Appendix). In other words, we chose not to ask participants directly about the cultural model investigated (see D'Andrade, 2005). After all, also by definition, the interviewees hold cultural models mostly out-of-awareness.

As important as language is in exploring the mental organization of knowledge, that is, cultural models, analyzing linguistic production does not exhaust all the possibilities in exploring the mind. Cognitive tasks should be administered to obtain further data. Some tasks allow one to explore memory (free listing tasks), other tasks explore categorization (sorting tasks), yet other tasks allow one to investigate the organization of knowledge strategies (drawing tasks), and others the assignment and establishment of relationships (rating tasks), for example, causality. Free listing tasks were completed, and results of their analyses are reported by almost all the authors in this volume. Other tasks are planned to be used in the future when the research project is eventually continued and brought to its necessary conclusion.

A number of analyses of the ethnographic and linguistic data collected follow their acquisition. The scholars analyzed ethnographic data, including inferences about relationships that were not explicitly stated. For example, when a Tongan subsistence farmer states that *taro* (among other crops) must

be planted with full moon, we infer that the moon (physical environment) and *taro* (plant) are related in some significant way. The same is true for Amazonian farmers who only plant during waxing moon.

The transcriptions of the semi-structured interviews[3] are analyzed at the word, sentence, and discourse level. The analysis strategies employed include the finding of key words via a frequency analyses of the words in all the interviews. The top most frequent and salient words—relevant to the topic investigated, that is, Nature in our case—are then used for a semantic role analysis (sentence level). That is, it is determined if each of the words selected is used in the 'agent' or 'patient' role. This analysis provides insights into the role(s) that various words—related to the six components of Nature, plants, animals, physical environment, weather, people, and supernatural or local adaptations of these components—play within the interviewees' construction of their linguistic production as molded by their cultural model of Nature. Thus, a first insight into the content and structure of the cultural model sought for begins to emerge.

The next linguistic analysis is about metaphors used (sentence level). The frequency of the various types of metaphor possible (see Lakoff and Johnson, 1980) provides further insight into the cultural model activated. Moreover, an analysis of the types of source and target of the metaphors used also increases the understanding of which aspects of Nature are most commonly mobilized to 'explain' those parts of the world addressed in their linguistic production. For example, is it animate beings who are used to 'explain' (i.e., source, hence, known) inanimate ones (i.e., target, hence, unknown) or the other way around? What type of animate beings are used? Insights into relationships between aspects of Nature can be obtained by the results of such analysis.

Finally, an analysis of reasoning passages (discourse level), especially those referring to causality, is conducted. The results of this analysis ensure the opportunity to ascertain important relationships established within components of Nature, for example, a plant and another plant, and across components, for example, plants and animals. Since causality is one of the most common type of relationships established among components of the world, it can become the focus of the analysis. Thus, a further insight into the content of the cultural model of Nature is achieved.

The results of the analyses conducted on the ethnographic and linguistic data already provide sufficient ground to formulate a hypothesis about the cultural model of Nature held by the populations under investigation. This hypothesis consists of a number of propositions about the way in which the major components of Nature stand in salient relationships to each other—a causal model could also be arrived at from such content.

The preliminary hypothesis about a cultural model of Nature can be refined and/or confirmed by the results of the analyses of cognitive data. The most frequent words (adjusted frequencies) obtained from the free listing tasks about the components of Nature provide the input for sorting tasks.

The latter are an effective way to elicit overall similarity judgments among a set of items. The sample's aggregate item-by-item similarity matrix is then analyzed using multi-dimensional scaling and cluster analysis. The results of these two analyses supply potential categories as salient constituents of the Culture Model sought for. In fact, they suggest relationships between items within a category or between categories. Thus, they contribute to a necessary refinement of the hypothesis arrived at from the analyses of the ethnographic and linguistic data obtained earlier.

A cultural model of Nature hypothesized by the results of these procedures consists of a list of propositions that need to be validated by other means (D'Andrade, 2005). The propositions form the basis of a fixed-format, 'strongly agree to strongly disagree' questionnaire. Validation of the hypothesized elements of the model is done by univariate analyses of the questionnaire's items. Finally, because culture is seldom distributed uniformly among individuals in a community (see Kempton and Clark, 2000; Gatewood and Lowe, 2008; Atran and Medin, 2008), the degree to which cultural models of Nature are shared, and the degree to which they differentially motivate people to act is assessed through a consensus analysis on the questionnaire data.

This methodological trajectory just presented represents an ideal one to implement when searching for cultural models in a specific community/population/culture (Bennardo and De Munck, 2014). Keeping this methodological trajectory in mind, the authors of the chapters in this volume have all conducted ethnographic, linguistic, and cognitive data collections and analyses, each representing a unique assemblage of a specific deployment of a number of methodological tools. All the authors end their methodological excursus by reaching enough insights into the community investigated such that a strong hypothesis about a commonly held cultural model of Nature could be advanced. We are convinced that additional research in the near future would add further support to the hypotheses formulated.

Causal models in Cultural Models of Nature

The authors in this volume hypothesize a variety of cultural models of Nature found in the communities investigated. These cultural models represent specific organizations of the ethically suggested constitutive categories underlying the concept of Nature, that is, plants, animals, physical environment, weather, humans, and the supernatural. Causal relationships are one of the major forces weaving together these categories. When presenting hypotheses about a cultural model of Nature in the communities investigated, many scholars characterize the internal causal structure of the cultural model by making reference to and at times refining one or more of the three causal models suggested by Bennardo (2014) (for causal models see also Sloman, 2009; Rips, 2011).

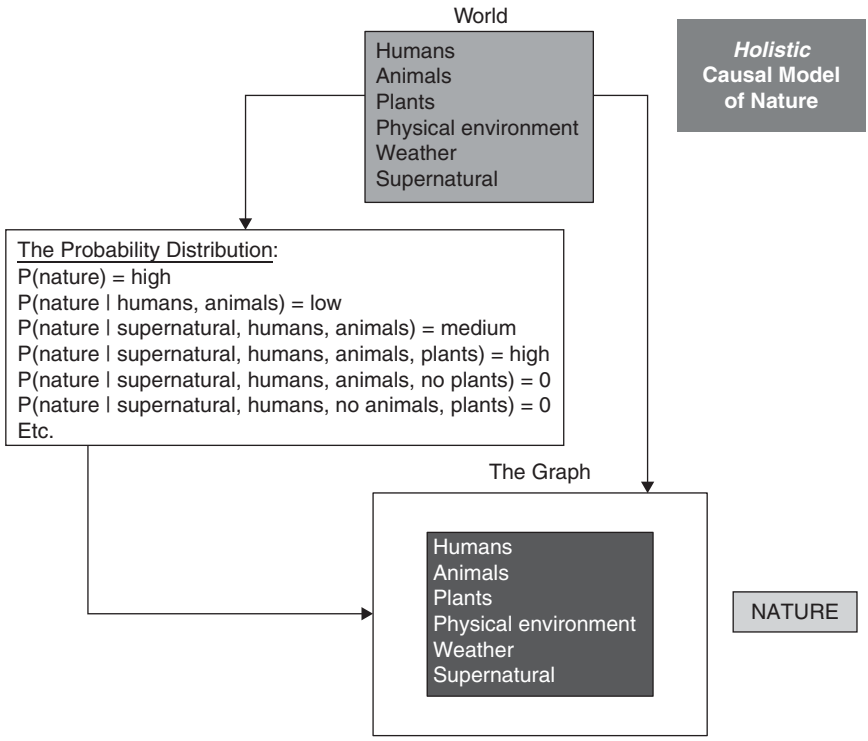

Figure I.3 Holistic CM of Nature (Bennardo).

The three causal models suggested in Bennardo (2014) are the *Holistic* model (see Figure I.3), the *God-Centered* model (see Figure I.4), and the *God-Humans-Centered* model (see Figure I.5). The *Holistic* causal model in Figure I.3 is based on 'The Probability Distribution'—obtained from descriptions of cultural models of Nature in Kempton, Boster, and Hartley (1995), Selin (2003), and Atran and Medin (2008)—of the six components[4] of Nature or the 'World.' Notice, that the more of the six components that are co-present, the higher the level of positive probability for the construction of the concept of Nature becomes. The causal model is then represented in the box labeled 'The Graph,' that is, the concept of Nature. For this holistic model, Nature includes all the six components insofar as no clear separation among them is conceived as probable: This conclusion is drawn from the content of 'The Probability Distribution.'

The *God-Centered* causal model in Figure I.4 is based on a different probability distribution. For example, the probability increases when the 'supernatural' is present, but it disappears when it is absent. The graph makes clear that the 'supernatural' component of the 'World' is separate from the other components when the concept of Nature is constructed.

The *God-Humans-Centered* causal model in Figure I.5 is based on a third type of probability distribution. The presence of 'supernatural' or both

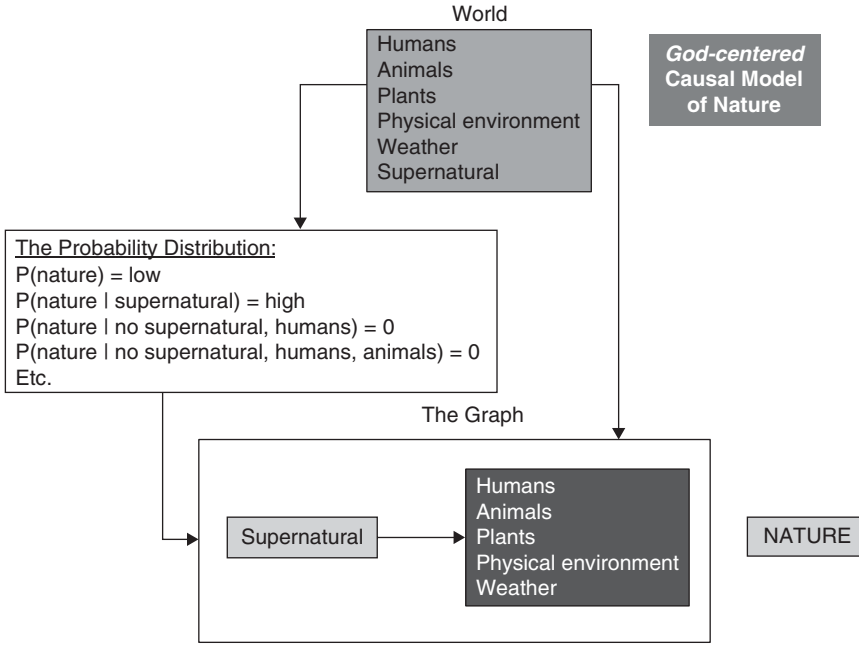

Figure I.4 God-centered CM of Nature (Bennardo).

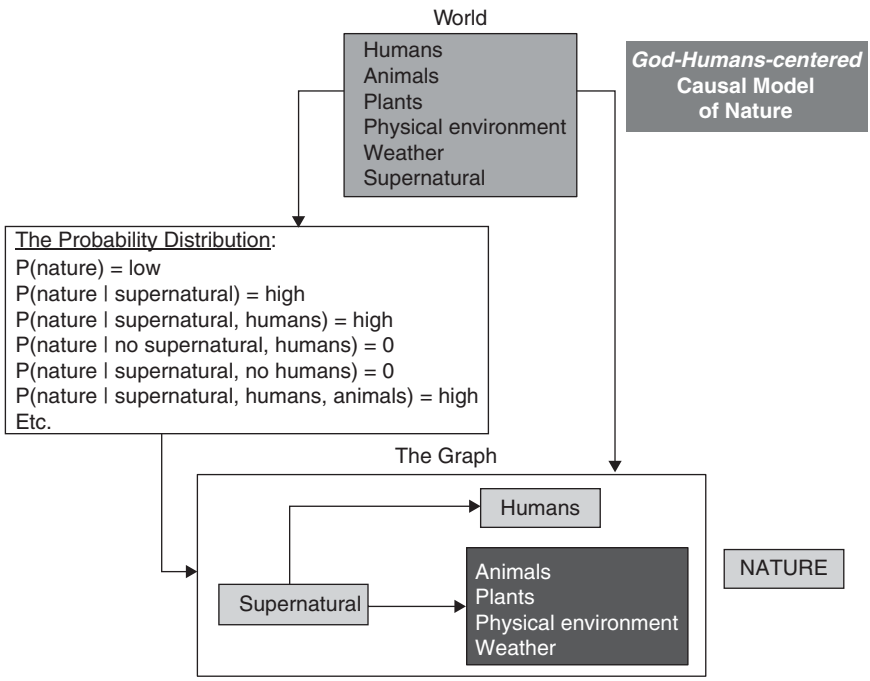

Figure I.5 God/Human-centered CM of Nature (Bennardo).

'supernatural' and 'humans' increases the probability while the absence of either of them makes the probability cease to exist. The graph makes clear that both the 'supernatural' and the 'humans' component of the 'World' are independently separate from the other ones when this concept of Nature is constructed.

The content of the cultural models of Nature hypothesized for the communities investigated by the contributors to this volume, have allowed us to expand this preliminary proposal. In fact, three new articulations of types of relationships among the basic components of Nature have emerged. The expanded typology of causal models is presented in the Conclusion chapter.

The chapters and the hypothesized Cultural Models of Nature

The chapters in this volume appear in alphabetical order by author. Each researcher first introduces the field site, that is, the community within which the collection of the data was conducted. Then, the methodology used is discussed in detail. Later, the results of the analyses on the data collected are presented and examined. Finally, the authors conclude by advancing a hypothesis about the cultural model of Nature discovered within the community investigated.

Before introducing the content of the various chapters, including the cultural models of Nature hypothesized by the authors, I want to point out that a number of commonalities emerged among the findings. First, members of all the communities investigated perceived changes in their climate-change-affected environment. Second, these changes were typically explained 'locally' and rarely related to 'global' causes. And third, many of the cultural models of Nature contained internal contradictions that often led the researchers to indicate the presence of two or more cultural models used within individuals or across individuals in any specific community. A more extensive discussion of these and other commonalities is presented in the Conclusion chapter.

In Chapter 1, Adem ethnographically explores the ways drought-prone farmers in Ethiopia's South Wollo region perceive and respond to increased variability in the timing, amount, duration, and spatial distribution of rainfall during the growing wet season. The vernacular explanation of farmers suggests a god-centered cultural model of Nature in which rainfall and all other economically useful natural resources, notably plants, animals, land and water, are perceived as divine gifts to humans from an all-powerful and omnipresent God, 'Allah.' This understanding has led a unanimous perception of the underlying causes of rainfall variability as divine acts. Yet, these farmers avoid fatalistic explanations of their vulnerability to perceived negative impacts by underscoring two complementary ways by which humans influence divine acts. The first involves pragmatic, household-level, agronomic responses fine-tuned to landscape-level variations in altitude, topography, biotic diversity, soil types, and moisture conditions. The other is

seeking Allah's mercy through village-wide rain-making prayers and communal observances, as well as invoking the help of 'mediating agencies,' such as angels, saints, holy men, sheiks, guardian, and ancestral spirits, and other invisible sacred beings.

In Chapter 2, Bennardo suggests the following minimal content of the cultural model of Nature for Tongans:

(1) Humans, plants, animals (mammals, birds, and fish), physical environment, and weather belong together;
(2) While humans belong with these components of Nature, they may also act on them and change them;
(3) Supernatural/God is not separated from other components of Nature, but is everywhere and also Supernatural/God is separated from nature, and masters nature—that is, plants, animals, physical environment, weather, and humans.

This hypothesis contains some issues that need to be pointed out. First, humans seem to be thought of as belonging together with any other component of Nature. However, they are also conceived of as acting on and changing plants, animals, and the physical environment, thereby appearing to be thought of as separate from these latter. Second, the immanence of the supernatural, that is, being one with any other component of Nature, is contrasted with its 'separation' from the other components, which allows 'causing' within the expressed 'mastering.' Third, in pursuing a resolution to the above-stated issues, it would be useful to keep in mind the Polynesian (and Tongan) traditional concept of *mana* or 'vital force.' This concept was and is deeply related to a conceptualization of all the components of Nature as holistically related. In spite of a hundred and fifty years of Christianity, the persistence of such a way of thinking in Tonga has been documented (see Bennardo, 2009: 188–189).

In Chapter 3, De Lima hypothesizes a cultural model of Nature for Amazonians with the following contents: (1) God, father above all, created everything, it is everywhere, and punishes his creatures if they act badly; (2) Below god, what belongs to humans contrasts with what exists in nature; (3) Everything in nature have specific mothers or owners that live beneath water and soil environments, and may help/punish 'people' if they do not take care or destroy nature; (4) Within soil and water environments, humans live between the 'inside-outside' (of the river/lake), and 'center/periphery' (of the forest). The house is thought as a 'center' around which other human environments radiate from, in the midst of 'nature'; (5) Destructive acts upon nature are commonly described as caused by greedy people; (6) Climate changes are mainly attributed to deforestation, and its effects are being especially felt by plants because the soils are poorer, the days are warmer, the rains are scarcer, the droughts are harsher, the forests are drier, the manioc roots are weaker and threatened to cook under the now hot soil.

In Chapter 4, De Munck states that Lithuanian farmers have adapted to being subject to the regulations and benefits of belonging to the EU and points out their sense of identity in relationship to their farms and nature. In his research it became clear that farmers had a distinctive but overlapping model of farmland and nature. Their models of both overlapped in that farmland was also nature but nature was not only farmland. Farmers also had two distinctive identities in relation to these dual conceptions of nature. As farmers they conceived of themselves as industrious and feeders of the nation; in their non-farming role nature was viewed as it is for most all Lithuanians as all encompassing and revitalizing. Farmers noted that climate was changing but viewed it pragmatically and locally in terms of how to adapt to these changes rather than as ideologically and globally.

In Chapter 5, Jones hypothesizes a cultural model of Nature for people from a farming village near Cotacachi, Ecuador. He explores causality and relationships between humans, plants, animals, the supernatural, weather, and features of the biophysical environment, as well as the relative importance of each of those domains and their components. The goal is to understand through what cultural lenses these food producers understand environmental change. Results suggest that Nature—with care of soil, responsibility to others, and attention to the Earth Mother at its core—can exist without cities and without the Christian God. Dividing the spirit world between Christian spirits and Earth Mother, as well as dividing humans between urbanites and rural dwellers, may generate more than one cultural model of Nature, may cause cognitive dissonance and may be supported by common Christian and Western/urban dualisms. However, these divisions also allow people to switch from one way of life to another, and to invoke the cultural model that is appropriate for a given setting. This may also be a consequence of the social and ecological changes these farmers are experiencing.

In Chapter 6, Lyon and Mughal present a coherent cultural model that reflects local farmers' concept of nature in Attock District, Punjab, Pakistan. Local farmers in northern Punjab do not spontaneously articulate a bounded concept of 'Nature' (*kudruti mahole*), but have clear ideas about the relationship between the Divine (Allah), the natural resources around them and the moral, political and economic positions of people. This ideal relationship spells out the incumbent responsibilities and opportunities of people in their natural environments and provides explanatory narratives for good and ill fortune. Leveraging local knowledge to better implement agricultural interventions is challenging, but they argue critical for the development of sustainable food production and environmental stewardship at a time of steadily degrading environments with rising populations across Punjab. They conclude by arguing that understanding local interpretations of global doctrines of Islam, along with folk understandings of *kudruti mahole* 'Nature,' provides a valuable base model for a generative cultural model of Nature.

In Chapter 7, Paini discusses how the people of Vinigo, a mountain village situated in the Dolomites (Italian Alps), perceive changes in their environment. She also provides indications on how villagers interpret the effects of these changes. In their reasoning, they attribute agency to elements of the close physical environment and stress engagement, both symmetrical and asymmetrical, and interaction with them. They indicate the causes that have brought about these changes and the risks involved as well as their anxieties about the future. They perceive their environment as filtered by local knowledge which highlights salient reciprocal and asymmetrical relationships among fundamental components of Nature such as humans, plants, and animals. Paini suggests the following initial components of a cultural model of Nature for the Dolomitic community she investigated: (1) A reciprocal relationship between humans and woodland, this latter being a mixture of physical environment and plants—if humans take care of woodland, woodland gives back to humans; (2) A non reciprocal relationship between woodland and wild animals—increased woodland fosters the presence of more wild animals; (3) A unilateral relationship between weather and agricultural produce (plants) and human activities, that is, weather affects these latter, but these latter do not affect weather.

In Chapter 8, Shimizu and Fukushima state that the Japanese word for nature, *shizen* (自然), has two basic meanings: To be 'natural,' that is, to be 'spontaneously or naturally so' (Tucker, 2003: 161); and that which pertains to the natural world, that is, the environment and creatures in it (Tucker, 2003; Shimizu, 2012). Consequently, they generate a hypothesis about what constitutes 'natural' (meaning 1) ways to produce foods via 'nature' (meaning 2). Using both meanings, they propose a cultural model in which they state that 'nature' is not 'natural' until it is 'humanized.' An analogy here may be that of creating a *bonsai* tree, the art of producing miniature trees that 'mimic' the way they 'naturally' grow. This view contrasts with the two other alternative views, that nature is 'below' human to be used as *the means to* achieve utilitarian gain, or 'above' them in that it is too powerful and beyond human control (e.g., natural disasters).

In Chapter 9, Widlok reports on field research in Namibia, contextualized in the region of sub-Saharan Africa at large. Based on this empirical work with rural people in the region, the problems of connecting scientific interests in 'climate' and 'nature' with local experiences of weather and the environment are being highlighted. The case material suggests that local models of nature are not limited to the spatial dimension but also include ways of conceiving time and the future. Moreover, the distinction that is commonly made between the natural environmental change and man-made change is problematized. By revisiting the distinction between 'wild' and 'domesticated' in the light of the case study, the author also suggests that it is appropriate to broaden our understanding of 'cultivation,' 'culture,' and 'cultural models.'

In Chapter 10, Wiegele presents components of a cultural model of Nature held by fishermen in two communities in the Verde Island Passage,

Philippines. The components reflect the complex mix of traditions and contemporary situations of these people who have multiple historical and cultural influences. In addition, the fishermen in these two communities have vastly different experiences with their environments in terms of preservation, degradation, and changing weather patterns that present serious challenges to their livelihood in different ways. The cultural model she presents suggests that the major components of Nature (humans, plants, animals, weather, physical environment, and the supernatural) are related to each other holistically. In this approach humans are the source of a personification metaphor that explains how Nature in general and the earth (holistically) works—through cycles of life moving naturally from young to old (to death), or cycles of life that involve continuous regeneration. God may act through nature (especially the weather and the earth in general) and the weather or the earth may have a 'life' of its own; either way they have moods and emotions that parallel those of humans. Furthermore, people, God, and other supernatural entities are connected reciprocally in a variety of ways to the physical environment (geographical features, plants, and weather), and animals (including fish). Even global concepts such as 'the earth' and 'the climate' are at times conceived in human terms.

In Chapter 11, Zhang examines how the ethnic Kachin in Southwest China conceive of nature and environment. He begins with the local scheme of time that captures the causal relationships among people, the supernatural, and physical environment into a rhythmic pattern. The Kachin seek a synchronization between these rhythms and their activities: The seasonal rhythm defines their activities within a year, and the local divination table specifies those within a day. Such a synchronization can be easily broken by human desires that expand excessively. The Kachin have also developed techniques to maintain, or to make up, synchronization through the local tradition of animal sacrifice. In bad situations, when synchronization has been broken too deeply, nature will move away, and humans are left behind.

Relevance of the volume

The content of the chapters contained in this volume significantly contribute to and enrich the already conspicuous literature about cultural models. Specifically, they all focus on cultural models of Nature in many and diverse communities of primary food producers. This common focus allows comparison across these communities located in extremely different environmental contexts on six continents. Interesting similarities emerged and are presented in the Conclusion chapter. Local peculiarities in cultural models of Nature held also emerged and both findings point towards a rich and varied set of beliefs and behaviors that members of these communities hold when confronted with the effects of climate change.

The tripartite methodological trajectory required by the adoption of Cultural Models Theory and uniquely implemented by the researchers

follows the suggestion by Bennardo and De Munck (2014: 286) that recommends such a trajectory as being the necessary procedure to discover cultural models. The results of the various projects conducted support that trajectory as appropriately conducive to that discovery. None of the researchers used the suggested trajectory in its entirety. However, relevant aspects of its content were implemented. Above all, the necessity of the acquisition of extensive ethnographic knowledge turned out to be of paramount importance. Similarly, the analyses (and their results) on the acquired linguistic data were the most productive methodological steps in arriving at solid hypotheses about cultural models of Nature. Cognitive data (e.g., free listing) as well showed how crucial they are in constructing, verifying, and validating hypotheses.

Scholars, policy makers, and lay individuals who actively conduct research on, and pursue solutions to, climate-change-induced-problems, a challenging species-survival issue, should benefit from the information on local cultural models of Nature contained in the chapters included in this volume. In fact, we are convinced that cultural models of Nature contribute to the generation of a variety of behaviors in response to environmental changes in food-producing communities worldwide. Then, it follows that this information should be regarded as highly valuable and can assist policymakers in their decision-making (see Kempton, 2001; Lauer and Aswani, 2009). Taking this knowledge into consideration is essential for the planning and implementation of any successful intervention projects in climate-change-affected areas. In other words, the research results presented can contribute in fostering sound policies based not only on decontextualized scientific notions, but grounded in the local knowledge of the people directly responsible for adopting any suggested modifications to their daily practices and very likely already engaged in the generation of solutions.

Appendix

Semi-structured interview

Questions about daily activities

Personal questions precede the following ones:

1. Describe your work/job (which relates to primary food production).
2. What is your typical work/work day?
3. What is the rhythm of work in this area … or actual activities?
4. What are some of the essential knowledge, skills, experience you need to be a successful food producer?
5. What are considered ‘productive activities’?
6. Which fields/sea areas/etc. are productive?
7. What affects productivity? What forces have an influence on production success?

8. What is meant by growth; why do plants grow?
9. What are the key decisions one must make to be successful?
10. What information do you need to make decisions?
11. How do you choose what crops to grow, what to fish, what to go after?
12. What are some of the constraints/problems you face as a food producer?
13. Who or what affects your environment (fields, forest, sea, etc.) the most?
14. What is the worst/best thing humans can do in fishing/farming/etc.?
15. What do you like/not like about what you're doing (satisfaction)?

Questions about climate change

16. What changes have occurred in your work/environment?
17. Why are there these changes/variations?
18. Weather change, how?
19. What can humans do about it?
20. Can humans/human activity affect nature/weather/wind/currents?

Notes

1 A 13th and a 14th site (Ethiopia and Amazon, Brazil) had been added later and the two scholars were not able to report about completed analyses. This volume, though, includes their reports (see Chapters 1 and 3). Also, three scholars are not contributing the results of their research to this volume (Kenya, Poland, and United States).
2 No field work could be conducted in summer 2013 because the NSF funds became available only in September.
3 These texts can be reduced to their gist—and care should be taken in using the interviewees' language when constructing the gist—before starting the linguistic analyses (D'Andrade, 2005). An added benefit of the gist analysis is that the researcher acquires an extensive familiarity with the texts. However, certain type of analysis, e.g., semantic role analysis, are better conducted on the original texts.
4 The components vary with each community investigated, thus making the content of the 'World' vary as well. The components presented are only suggestive of possible ones. The ones that each scholar eventually uses are the ones they discover in their community.

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