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Cat's Cradle as a Relational Framework in Mapping Traditional Knowledge:  
Herders of Kazakhstan, Farmers of the Italian South, and Tribal Communities of the US Gulf Coast

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*Research Article*

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## Cat's Cradle as a Relational Framework in Mapping Traditional Knowledge: Herders of Kazakhstan, Farmers of the Italian South, and Tribal Communities of the US Gulf Coast

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Dilraba Anayatova\* & Arina Melkozernova†

### Abstract

*Traditional Knowledge (TK) encompassing Traditional Ecological Knowledge (TEK) and Local Ecological Knowledge (LEK) is alive, adaptive, and relational. It is a continuously generated reciprocal relationship with the communities and more-than-human worlds. This article examines three geographically distinct cases – nomadic herders of Kazakhstan, peasant farmers of the Italian South, and tribal communities in the U.S. Gulf Coast, through frameworks of relationality, which integrate relational research and critical attention to disciplinary boundaries. Drawing on Haraway's cat's cradle as both metaphor and method, the article argues that TK systems are shaped by historically entangled epistemologies that resist binary frameworks opposing Western and Indigenous, modern and traditional, global and local knowledge. Through comparative analysis, the article traces a recurring pattern: dominant narratives, including the barbaric nomad, the backward peasant, and the vanishing Indian, have systematically delegitimized 'subaltern' TK as a mechanism of dispossession, yet all three communities maintained the relational logic of their knowledge systems. Resilience, the article argues, is not the preservation of knowledge intact but the maintenance of the reciprocal relationships through which knowledge is continuously regenerated.*

### Cat's Cradle as a Relational Framework in Mapping Traditional Knowledge

Traditional knowledge is not a relic. It is not a romantic remnant of pre-modern life waiting to be catalogued, preserved in amber, or redeemed by Western science. It is alive, adaptive, and deeply entangled with the places, bodies, seasons, and relationships through which it is continually made and remade. This article begins from that premise and builds outward from it, arguing that Local Ecological Knowledge (LEK) and Traditional Ecological Knowledge

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†Arina Melkozernova holds a PhD in Comparative Culture and Language from Arizona State University. Her research ethics lean on the community participatory principles evolving from the interdisciplinary research fields. Arina collaborates with communities to restore their "place-embodied" narrative through mapping their traditional knowledges and community memories. Her multidisciplinary background in art, science, indigenous studies, digital humanities, educational technology, and instructional design contributes to building new research pathways within academia with criteria for inclusivity, data sovereignty, and epistemological flexibility. Arina is the recipient of the [2021 Future Steward Excellence Award](#) for her work in partnership with several Indigenous communities.

(TEK) referred to here collectively as Traditional Knowledge (TK), can only be understood through frameworks that honor their dynamic, relational, and non-linear character.

We examine TK systems maintained by communities and the stories of reciprocal relationships between humans and non-humans across three sites: rural Kazakhstan, the Italian South (Cilento region), and tribal communities in the U.S. Gulf Coast (MOWA Choctaw Tribal Band of Indians, Alabama). These cases are not presented as parallel illustrations of a single thesis. Rather, they are held together as a cat's cradle holds its strings in a configuration that reveals patterns without demanding uniformity. The Navajo version of the cat's cradle game, called *na'atl'o'*, is one of Haraway's central figures for thinking about multispecies entanglement and co-production of knowledge by playing string figures with companion species for cultivating multispecies response-ability" (Haraway, 2016, p. 10). We borrow this figure merely not as a metaphor but as a method – a way of tracing the connective tensions between knowledge systems without flattening them into sameness.

The distinction between LEK and TEK is meaningful and merits attention. TEK, as defined by Berkes (2008), refers to "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (p. 3). It is associated primarily, though not exclusively, with Indigenous peoples and carries with it the weight of colonial erasure, ongoing sovereignty struggles, and epistemic violence. LEK, by contrast, has been applied more broadly to include non-Indigenous rural and farming communities whose intimate, place-based, intergenerational knowledge of local ecosystems similarly resists reduction to technical data (Albuquerque et al., 2024; Berkes et al., 2000). Both terms have been contested, appropriated, and misapplied. What they share — and what this article tracks — is a commitment to relationality: to knowledge generated through ongoing, embodied, reciprocal interaction with human and more-than-human worlds.

This article adopts two complementary theoretical frameworks: interdisciplinary relational research and spatial relationality. Relational research, as developed through feminist science studies and more-than-human geographies, attends to the co-constitutive nature of knowers and known, foregrounding entanglement over extraction (Haraway, 1988; Tuck & McKenzie, 2015). Interdisciplinarity is based on diverse scholarly approaches including indigenous ecology, ecofeminism, biosemiotics, applied history, and environmental humanities. Relationality, drawing from feminist geographers and scholars of place-based knowledge, resist the impulse to map knowledge as fixed territory and instead trace the living, contested, and shifting landscapes through which knowledge moves (Braidotti, 2011; Tsing, 2000). Together, these frameworks allow us to sit with the messiness that TK systems actually exhibit — messiness that Western science and colonial and modernist epistemologies have long tried to domesticate or dismiss.

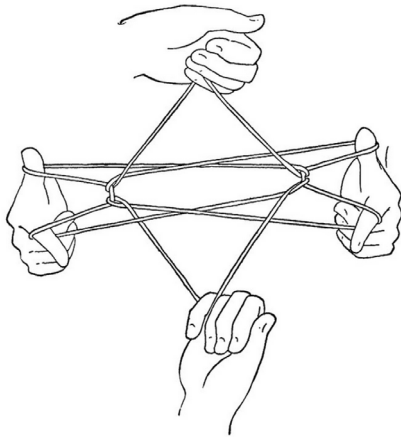
One of the persistent errors in TK scholarship has been what Nygren (1999) identified as the twin traps of treating local knowledge either as "a scapegoat for underdevelopment or as a panacea for sustainability" (p. 268). Both moves otherize communities and reproduce the

binary logic of Western/traditional, modern/archaic, global/local that this article actively resists. Following Tsing (2000) and Braidotti (2011), we insist that these binaries are historically constructed through colonial hierarchies and continue to distort our understanding of how knowledge actually works. Knowledge is not a possession; it is, as Barad (2007) argues, part of "the ongoing materialization of the world" (cited in Peach, 2024, p. 9). It changes. It is transmitted but also transformed through migration, sedentarization, disaster, resistance, and creativity.

The article proceeds as follows. We first outline the Relational Framework that guides our analysis, centering Haraway's cat's cradle as both figure and methodology. We then move through our cases: the more-than-human relationality embedded in Kazakh nomadic knowledge; the relational foodways of Cilento farmers in southern Italy; the land-based knowledge practices of the MOWA Choctaw tribal community in Alabama. In each case, we attend to the function of storytelling and embodied practice in transmission, and the ways communities have mobilized TK as a strategy of resilience and reciprocity in the face of ecological and political precarity. We conclude by arguing that TK systems that include reciprocal relationships between humans and non-humans are future-making, not bound by the past, and act in the present as the backbone of community resilience by shaping the conditions of survival, sovereignty, and care.

## **Relational Frameworks**

The Cat's Cradle game inspired us to interpret string figures as visualizations of embodied relationality. In 1906, Caroline Furness Jayne published a book, "String Figures: A Study of Cat's-Cradle in Many Lands", republished by Dover in 1962 as *String Figures and How to Make Them* (Figure 1). She described this game as "widespread among primitive people, and played by weaving on the hands a single loop of string in order to produce patterns to represent certain familiar objects." (p. v). Because this work was written in 1906, its characterization of Native peoples reflects the perspectives and language of its time; we are not aware of the author's own position or intent, nor do we intend to draw any criticism. Jayne aimed to share her fascination with 'Indian' games with young and old alike. In this article, we apply the Cat's Cradle gamer mindset both as a metaphor and a method for a particular way of thinking that persists in pattern recognition, strategic adaptive futures, and complex systems thinking, to explain our Relational Framework.

**Figure 1.** *A cat's cradle string figure*

Note. From *String Figures and How to Make Them* (p. 334), by C. F. Jayne, 1962, Dover Publications (original work published 1906 as *String Figures: A Study of Cat's-Cradle in Many Lands*). Public domain.

[https://commons.wikimedia.org/wiki/File:String\\_Figures\\_and\\_How\\_to\\_Make\\_Them.djvu?page=377](https://commons.wikimedia.org/wiki/File:String_Figures_and_How_to_Make_Them.djvu?page=377)

In 1994, Donna Haraway published “A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies,” in which she proposed the cat's cradle not as a metaphor but as an epistemological practice. The game is played between at least two pairs of hands, producing figures that are neither the creation of one player nor the other, but of the relationship between them, which refuses the logic of singular authorship and linear causality. “*Cat's cradle is...*” Haraway writes, “*a mathematical game about complex, collaborative practices for making and passing on culturally interesting patterns. Cat's cradle belongs to no one, to no 'one' culture or self, to no frozen subject or object*” (Haraway, 1994, p. 70). The Navajo version, *na'atl'o'*, is more complex; it is a cosmological performance, a teaching practice, and a mode of connection between generations and species, a way of thinking with the world rather than about it (Haraway, 2016). We adopt this figure as the methodological spine of this article because it does what our subject matter demands – it holds multiple threads in tension without resolving them into a single pattern, and it requires more than one set of hands.

The communities whose knowledge systems we analyze, Kazakh nomadic herders, Cilento farmers, and MOWA Choctaw land stewards, have each maintained or at least remembered ways of knowing that are deeply relational. They produce knowledge without separating the observer from the observed, the human from the non-human, or the past from the present. Their holistic knowledge emerges from sustained, reciprocal, embodied engagement with specific places and the more-than-human beings that inhabit them. The Relational Framework offers a way to study these systems without assuming that knowledge is universal, transferable, or produced by a detached rational subject assumptions that reproduce the very epistemological violence that has historically been used to delegitimize TK. This adds another layer of recognition for human-constructed patterns that can have real

consequences, harming cultural narratives and exploiting sacred beliefs. The Relational Framework enables the cat's cradle gamer mindset and insists on a different posture: one of entanglement, response-ability, and what Haraway calls "staying with the trouble" (2016).

### **Relationality and Traditional Knowledge in Research**

In Indigenous cosmologies, relationality is a central principle of viewing the world. For example, in Cree, *wahkohtowin* translates as "we are all related" (Wilson, 2020), meaning not only individual, family, and community levels but also all other living beings - a "relational way of thinking, being, doing, and living at its center" (Wilson, 2020, p.59). Similarly, according to Cajete (2000, p. 41), "all relationships are related to other relationships," pointing to the interconnectedness inherent in Indigenous philosophies. Both Indigenous and Traditional Ecological Knowledge systems prioritize the enactment of relationships over the study of object-based studies (Tuck & McKenzie, 2015). TK shares many parallels with Indigenous principles of relationality through continuity defined by Burkhart as "a power in the land that creates knowledge through locality that arises in first-person experience in the act of 'seeing' through relational kinship" (Burkhart, 2019, p.119).

Relational research, as a methodological orientation, draws from feminist science studies, more-than-human geographies, and Indigenous research methodologies. Relational research also has practical implications for how we approach TK systems. Rather than extracting knowledge from communities as data to be analyzed elsewhere, relational research situates the researcher within the web of relationships that produce knowledge accountable to those relationships and changed by them (TallBear, 2014; Tuck & McKenzie, 2015). Frid described the proactive position of the conservation scientist in the Anthropocene that resonates with our position as researchers who follow principles of relational research. Frid (2019) writes:

Catastrophe can be our teacher, but it need not be the only one. Almost always, I stay away from dualistic perspectives. Good and evil. Heaven and hell. Us and them. I found these dichotomies limiting. I relate more to blurred edges, gradients, and non-liberalities that characterize many Indigenous worldviews, which differ only so much from how ecologists see the natural world. Yet Indigenous stories go deep into territories where ecologists cannot venture, invoking the spiritual and supernatural. As an empiricist, I interpret these as metaphor (p.149).

Frid's willingness to dwell in the blurred edges while holding empirical and relational ways of knowing in productive tension are models the epistemic posture this article adopts: not the detached observer who stands outside the web, but the responsive participant who recognizes that the knowledge produced is always shaped by the relationships through which it is sought. We play cat's cradles as well.

That posture is not ours alone; it is already at work in the knowledge systems we examine. Kaimuldinova and Abdimanapov (2014) note that in the Kazakh worldview, interaction with nature is structured not as subject-object but as "subject-subject" (p. 17). Our analysis of the stories of relational foodways among the MOWA Band of Choctaw Indians in Alabama, USA, and their long-term relationships with land demonstrates cultural resiliency and sustainable

land use. In each of these traditional lifestyles, relationality is not a philosophical add-on but the foundational logic through which knowledge is generated, transmitted, and renewed. The Cilento farmers' lifestyle linked to cycles of gardening seasons and their caring relationships with the surroundings demonstrate the connection between TK and traditional peasant knowledge preserved in their community.

The relational framework, which includes the whole system's approach to aligning research objectives with the complexity of the world and the diversity of worldviews (Alvarez, 2016; Salmón, 1999), honors this logic by crossing disciplinary boundaries between ecology and anthropology, feminist theory and Indigenous studies, environmental humanities and political science, food systems and cultural geography, holding the tensions between fields productively, as one holds the strings of a cat's cradle.

### **The Relational Framework: Question of Place**

The relational framework addresses the question of place. Traditional knowledge is always situated; it emerges from, and refers back to, specific landscapes, seasons, species, and histories. It cannot be abstracted from its ground without significant distortion. As Anishinaabe scholar McGregor (2004) states, "[m]any stories and teachings are gained from animals, plants, the moon, the stars, water, wind, and the spirit world. Knowledge is also gained from vision, ceremony, prayer, intuitions, dreams, and personal experience" (p.388). Furthermore, McGregor adds that people, land, and knowledge are whole and single. In addition, according to Barad (2007), knowledge is not confined to the individual being; whether one possesses it or not, it is part of the "ongoing materialization of the world" (cited in Peach, 2024, p. 9). Yet the dominant tendency in TK scholarship has been precisely to abstract: to extract practices from places, to translate living knowledge into databases, to represent the "local" as a bounded, knowable object available to a global gaze.

This tendency to abstract is not neutral. Latour (2011) notes that scientific research in modern society serves the interests of capitalism. In this system, scientists are the science workers. They produce knowledge that is privatized, commercialized, and is becoming a product for sale. Scientific knowledge in Western society is a commodity. The Green Revolution is an example of Western science supporting political decisions that harm the environment and often inflict irreversible cultural damage to local communities. The Green Revolution brought an array of new challenges, from human-inflicted overuse of pesticides and fertilizers to the pollution of water and soil imposed by aggressive land management by agro-industry and extractive technologies. Biodiversity on the global scale is affected by the dominance of monocrops of rice, corn, and grains and their genetically modified varieties. Corporations control the reproduction of endemic plants. The fact that 96% of all seeds are accumulated in four private seed banks demonstrates the scale of the removal of traditional knowledge associated with seeds from communities. In contrast to technoscience, biosemiotics recognizes the interconnectedness between humans and non-humans and inflates discourse advocating for the relational representation of non-sentient beings in connection to alternative knowledge systems' values that can overpower placeless politics imposed by capitalism (Méndez Cota, 2016, p.132).

Capitalism exploits humans' ability to learn by reducing their experiences to meaningless mechanics and excluding their relationship to the place and their responsibilities to protect it. The disciplines like Biosemiotics, Indigenous Ecology, Environmental Humanities, Applied History, and Cultural Geography bridge a gap between colonial rational mentality and Indigenous relational worldview by educating people about Indigenous ways of teaching and implementing them within a university setting to advance the indigenization of academia (Adamson, 2017; Burkhart, 2019). The storytelling aspect of this approach elicits an emotional response, which in turn stimulates long-term memory of the place (i.e., the traditional homeland). The knowledge is constructed from the bottom up through self-led discovery learning, changing the meaning from literal to conceptual and metaphorical (Pete, 2023; Simpson, 2017). Pedagogy based on walking together outdoors, unlimited exchange of information between diverse participants, and investment of time and energy in communication with the community are innovative for Western teaching and learning processes. The TK and the Indigenous philosophies and perspectives bring deep, place-based understanding to the study of complex natural and human systems (Chief et al., 2019). A surge of innovation and creativity in adopting traditions signals resilient strategies for stabilizing the community's cultural-and-bio-diversity system.

The relational framework combines principles of interdisciplinarity and TK, including principles of locality, reflected in relationships to the land and in strong connections between place and experience. On the contrary, anthropocentric, descriptive, and rational methods of science produce delocalized knowledge (Burkhart, 2019). It also includes interdependent elements of biodiversity, cultural diversity, and the cycles of life. With this framework in place, the research results demonstrated temporal and spatial connections between the locality of knowledge and skills that sustain community survival. The Indigenous and non-Indigenous communities are diverse, but mapping their spatial relationships shows that they share common values: accountability (sovereignty and cultural integrity), respect (worldview and knowledge system), responsibilities to the community, and prioritization of relationships.

### **More-than-Human Relationality Case: Kazakh Nomads' Ecological Knowledge and Deep Connection with More-than-Human Worlds**

In the cat's cradle of Traditional Knowledge systems, the Kazakh steppe offers one of the most intricate configurations. Here, knowledge was held not in texts or institutions but in bodies, seasons, animals, and the cyclical rhythms of migration. Cameron (2018) captures this succinctly: "the steppe<sup>1</sup> is synonymous with nomadism" (p. 46), where humans, animals, plants, and the environment are continuously interconnected and interdependent. It is an epistemological statement: knowledge of the steppe has been inseparable from living within it, moving with it, and attending to its signals across generations by creating a nuanced and

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<sup>1</sup> The steppe (*dala* in Kazakh) refers to the vast Eurasian grassland belt stretching approximately 8,000 kilometers from Hungary in the west to Manchuria in the east. The Kazakh steppe, which covers much of present-day Kazakhstan, is one of the largest continuous grassland ecosystems on Earth.

interconnected relationship within their cyclical lifestyle (Ferret, 2021; Kaimuldinova & Abdimanapov, 2014).

Kazakh nomadic ecological knowledge emerged from centuries of direct observation, survival experience, and intimate interaction with nature across vast and climatically extreme territories. It was never abstract. Its unit of transmission was not the proposition but the practice the movement of an *aul*<sup>2</sup> between spring (*kökteu*), summer (*zhaylau*), fall (*küseu*), and winter (*qıstau*) pastures; the precise timing of lambing (April 1 to April 15, no earlier and no later); the reading of animal behavior to forecast weather (Abishev, 1949; Ferret, 2023). A herder who could identify every individual sheep in a flock of 500 to 700 and accurately match each lamb to its mother was not performing a feat of memorization; such herders were enacting a form of knowledge that is relational, embodied, and deeply place-specific (Abishev, 1949).

Time is considered cyclical since the pastoral nomad time is repeated yearly, coinciding with the seasonal changes and livestock breeding schedule (Ferret, 2021). This cyclicity is itself a form of knowledge. It structures observation, calibrates expectation, and orients community decision-making. When the vegetation in the summer pasture began to fade, movement to the fall pasture followed as a matter of deep ecological understanding. Environmental changes, including low precipitation and harsher winters, required adaptation: nomadic communities could move eight to twelve times yearly in search of better pasture (Kaimuldinova & Abdimanapov, 2014). These movements were not as messy as a colonizer would think. Far from being fixed or static, this knowledge system was continuously responsive to conditions on the ground.

Central to the Kazakh nomadic worldview is what we term, following Robertson (2018) and Whatmore (2017), a more-than-human relationality, a way of being in the world that radically decenters the human without excluding it. Nomads endowed their livestock with agency: animals were understood to choose the correct pasture, find the best path, seek pure water, and signal the opportune moment to move (Ferret, 2021; Kaimuldinova & Abdimanapov, 2014). It is a form of attentiveness, a recognition that the knowledge of when and where to move is distributed across species, not concentrated in the human herder alone.

Five key species – sheep, cattle, goats, horses, and camels were not merely resources. Each held a complementary nature, contributing to the community's ecological and social fabric. They were also given agency to choose the correct pasture, find the best path, seek pure water, and determine the opportune moment to move. Each also had a guardian spirit: sheep were protected by *Shopan-Ata*, camels by *Koysyl-Kara*, horses by *Kambar-Ata*, and cattle by *Zengi Baba* (Abishev, 1949). The world of spirits, *aruah*, was not separate from ecological practice but woven through it — shaping how ancestors were honored, how blessings (*bata*) were sought before migrations, and how the home was purified with *adyraspan* (peganum) before

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<sup>2</sup> *Aul* (also spelled *ayyl*) is a distinctly Kazakh social and spatial unit that resists simple translation. In its traditional nomadic form, it referred to a kinship-based community of several families, typically between three and twelve households, who migrated together along shared seasonal routes, managed livestock collectively, and formed the primary social unit of Kazakh life. The *aul* was simultaneously a community, a territory, and a way of moving through the world: its boundaries were defined not by fixed geography but by relationships between families, between humans and animals, and between people and the landscapes they moved through.

major transitions (Penkala-Gawęcka, 2023; Dubuisson, 2017). Kaimuldinova and Abdimanapov (2014) describe this as an "archaic environmental consciousness" in which nature is perceived as a spiritual value and interaction is structured as "subject-subject" (p. 17) – contrast to Western modernity's positioning of nature as object and resource.

The forced sedentarization of Kazakh nomads under Soviet colonization represents one of the most devastating disruptions of TK transmission in Central Asian history (Anayatova, 2025). Soviet agricultural policy dismantled the mobile infrastructure through which ecological knowledge was generated and passed down, the seasonal migrations, the communal herding practices, the intergenerational apprenticeship of learning to read animals and land together (Elie & Ferret, 2017). The knowledge did not disappear, but it was transformed and enacted on a smaller scale, adapted to new constraints, carried forward through oral tradition, family practice, and rural community life even as formal education increasingly aligned with Soviet and then post-Soviet epistemological frameworks.

This survival is itself significant. It demonstrates that TK is not merely transmitted, it is generated anew in each encounter between community members and their environment. As Kaimuldinova et al. (2023) argue, Kazakh ecological knowledge continues to be knowledge emerged from living with and understanding nature and its adaptations remain deeply rooted in socio-political and environmental contexts. The knowledge of the steppe did not freeze when the migrations forcefully stopped. It found new strings to hold onto – new hands to pass the cradle between. This has direct implications for how we understand resilience. Resilience, in the Kazakh nomadic context, is not the capacity to return to a prior state. It is the capacity to maintain the relational logic of knowledge, the attentiveness to animals, seasons, spirits, and community under radically altered conditions. It is, in Haraway's terms, a form of response-ability: the ability to stay in relationship with the world even when the world has been violently rearranged (Haraway, 2016).

### **The Sense of Place and Collective Memories: Mapping Cilento Relational Foodways**

If the Kazakh steppe shows a knowledge system holding its relational logic through forced sedentarization, Cilento shows the same logic under a different pressure: the global branding of the very foodways that sustain it. Any depiction of local farmers in Cilento, in Campania, Southern Italy, should start by discussing the challenges of mixing tradition with commercial enterprise. The history of Mediterranean Diet branding and its role in worldwide acculturation is increasing the risk of the disappearance of traditional foodways from their homeland territories (Vitullo & Melkozernova, 2024). The push towards a quest for a universal diet happening after WWII in our society's medical and wellness sectors explains the accelerating investment of industries in dietary research. Since 1950, when Keys developed his scientifically based notions of the Mediterranean diet, or what he called the "Mediterranean way," many institutions and organizations have championed it as one of the best food regimes to promote, if not the absolute winner of the endless rankings and a successful and universal solution for people living in the frenetic digital age with an industrialized food system (Vitullo & Melkozernova, 2024). The local people of the town of Pioppi in the territory known as

Cilento, where he experienced and learned the nutritional value of the Mediterranean Diet, were unaware of their unique Mediterranean lifestyle and continued living their lives in a poor, industrially underdeveloped country.

The true representation of Mediterranean identity of the Cilento farmers is in their response to climate change that exacerbates biodiversity loss worldwide. Communities are resisting the destruction by adopting sustainable practices rooted in traditional knowledge and by preserving their local foodways with heritage seeds. Antonello Di Gregorio comes from a dynasty of farmers dedicated to valorizing and relaunching ancient grains such as Senatore Cappelli Durum Wheat, Carosella Soft Wheat, and Gentil Rosso Soft Wheat in the Cilento region, southern Italy.<sup>3</sup> These varieties, especially *Senatore Capelli Durum*, contain higher amounts of polyphenols and gluten than modern durum. Recent scientific research sheds light on the properties of the ancient grains that farmers preserved based on their TK, demonstrating the healthy cardiovascular benefits of consuming old durum wheat (bread, pasta) and a reduction in gastrointestinal and extra-intestinal symptoms in non-celiac gluten sensitivity subjects despite its high gluten content (Giacosa et al., 2022). Antonello's terraced farm is located on the slopes of Monte Stella, in the region famous for white figs, heritage grains, and ancient beans like the chickpeas of Cicerale. In the garden, the sunflowers bordered the terrace with a few rows of corn plants, vines of beans hugging their stocks, and melons scattered in between exactly like the three sisters' garden in the US Southwest. This traditional North American garden in southern Italy manifested the mission of seeds' travels in delivering the knowledge of coevolving relationships between plants, pollinators, soil, and people from Native American to Italian farmers successfully. Three sisters (corn, squash, and beans) garden offers a plant-based dietary model where beans are the source of protein but compared to Mediterranean Diet the three sisters model is understudied despite its commonality among the Native American communities (Vitullo in Kitch et al., 2021, p. 14). The farm itself, which integrates olive groves with livestock (goats), represents, on a smaller scale, the traditional Mediterranean silvopastoral system classified as "seminativo arborato" (arable land with trees) in these dry lands: "the orchard provided pasture for animals which, in turn, controlled weeds and provided fertilization for the orchards" (Paris et al., 2019, p. 2247). The recently analyzed data of landscape management in Italy by an international group of scientific researchers showed the benefits of the "historical rural landscapes" that use a combination of rotational grazing and shade from trees to prevent soil erosion, increase hardseededness of grass-legume cover crops, and improve the environment in general (Paris et al., 2019, pp. 2245–2247).

The scientific research obtained evidence of a significant offset of the greenhouse gas emissions "produced by livestock and shelter grazing animals from 'heat waves' in the Mediterranean arable land and other agroforestry landscapes in Italy (Paris et al., 2019, pp. 2019–2244). The research findings indirectly credited local peasants and the traditional knowledge of land management they preserved for their survival in the dry land. This food

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<sup>3</sup> See Pignataro (n.d.), Agriturismo Pier delle Vigne, San Mauro Cilento, <https://www.lucianopignataro.it/a/agriturismo-pier-delle-vigne-san-mauro-cilento/105084/>

scarcity drove the peasants' and fisher people's creativity in building reciprocal relationships with the sea, the land, its animals, and plants to survive. The post-Columbian history of the Rarámuri, Indigenous peoples in Mexico, shows a similar pattern of "make it their own" by adopting new practices to their lifestyle (Salmón, 2000, p. 1331). After the Spaniards introduced sheep and goats, the Rarámuri adjusted their methods by adding manure to their fields to increase productivity and controlling grazing by constantly moving the animals to avoid overgrazing. Their kincentric ecological practices protected and preserved the biodiversity of the Sierra area, a home for ancient and heritage seeds "along with black bear, ocelots, puma, eagles, hawks, and many other mammals and birds" (Salmón, 2000, p. 1331). The affinities in the land management among cultures of local peasant farmers in Italy and Indigenous tribes in the Americas show their shared beliefs that maintaining a balanced relationship with the land is crucial to "enhance and preserve the ecosystem" they are part of (p. 1331).

Following the path of their ancestors, Antonello and his mentor Giuseppe, full of energy, fast-walking, charismatic teacher in his eighties and one of the founders of the Cooperativa del Nuovo Cilento, are constantly experimenting by studying the co-evolving relationships between farm inhabitants to contribute to better protection of olive trees from diseases and to maintain attractive traditional landscapes (Vitullo & Melkozernova, 2024). During our farm tour, Giuseppe's hands were busy clipping olive branches while he shared his concerns about the white moths, or olive psyllids, that feed on the olive trees and damage the harvest. Pruning helps reduce the harm and provides forage for goats. Antonello tried another method – he planted a mix of basil, thyme, and fennel seeds under the olive trees to take advantage of their antimicrobial and insect-repellent properties to prevent olive psyllid infestation. The connections between scientists and the community are getting stronger. Recently, "the Cooperative signed an agreement with the University of Salerno for the implementation of the "Circular Models" project for the regenerative management of agricultural soil. In 2020, in collaboration with the "Fattoria del Gallo Rosso" and Bella Farnia, it activated earthworm farming in olive pomace and compost. Well-respected in the community, Antonello Di Gregorio was elected president of the Nuovo Cilento Cooperative in 2022. He is a lead collaborator on the "Models" project with scientists from the University of Salerno Laboratory, focusing on the use of wild plants in agriculture for the recognition and collection of spontaneous food plants. The exchanges between the place-based knowledge of traditional farmers and culturally embedded scientific research lead to innovative ways to develop more diverse and thus more resilient food systems (Vitullo & Melkozernova, 2024). The future story of the San Mauro landscapes is carefully guarded by over 400 Cooperativa del Nuovo Cilento farmers under the trusted leadership of Antonello, who represents the younger generation.

Farmers like Antonello and Giuseppe are shifting the narrative of the Italian South from a backward country with the *cucina povera* (food of the poor) to a place-based Mediterranean Diet country, a diet that has earned global celebrity status. Valerio Calabrese, director of the Living Museum of Mediterranean Diet in Pollicio, which opened its doors in 2005 to commemorate the American physiologist Ancel Keys' legacy and recognize his contribution

in spreading knowledge about the traditional values of the Mediterranean way of living, described the sustainable food systems approach as “extremely important for our future.”<sup>4</sup>

And therefore, beyond our differences, there is a common principle of respect for nature and greater awareness of our consumer practices, because the consumption of natural resources concerns everyone globally, whether poor or wealthy. Since we all live on the same planet, we don't have an alternative. The knowledge of specific ecosystems, like that of the Mediterranean (in Cilento), can help recognize other ecosystems that are different but just as important to protect, preserve, and appreciate” (Calabrese, interview, 2021, translated by Chloe Larson). The Living Museum of the Mediterranean Diet reclaims de-territorialized knowledge of the Mediterranean Diet by putting it back on a locally grounded path that promotes the ‘universal’ values of the TK to younger generations (Vitullo & Melkozernova, 2024). The TK accumulated by people living in the place over millennia includes their spatial relationships, serving as evidence of their survival and existence in this environment.

### **Grasping the Indigenous way of knowing: the MOWA Band of Choctaw Indians of Alabama**

Knowing represents the community's commons. The insider's theory of Shandin Pete (2022), who is the Seliš scholar trained as a hydrogeologist, explains the “know” or the human endeavor of understanding our world as a commons for all the people without linking to a particular race of people or a particular human society:

...our experiences everything has to be validated for us to correctly categorize and logically apply our emotion into the right place at the right time for the right reasons and it has to be validated. We can have ideas and observations but oftentimes we have to have those things checked in with our community, the people we feel that are in our social structure that can answer those questions (18:32).

Learning is drawn from comparison. The land is the place where knowledge is situated. Traditional knowledge is an open system; the way of knowing through observations and interactions with others is opposite to science, which operates through quantifiable facts and subjective experiments and seeks universal rules. Lynette Hunter (2009) describes the affinity between situated knowledge and Indigenous people's traditional knowledge: “Unlike scientific knowledge in which the effect of the observer is often a 'problem' and many experiments are devised in order to minimize it, in situated knowledge the whole point is that the observer is engaged” (Hunter, 2009, p.151). Indigenous knowledge comprises place-specific, embodied experiences in relation to the surroundings.

During a mapping excursion, Michael Orso, the representative of District 2, Washington County, showed us plants the MOWA Choctaw used to forage: American beautyberries for making jelly and a yaupon bush. A tea or coffee-like drink prepared from its baked leaves contains an amount of caffeine comparable to coffee beans. This so-called Black Drink is documented in the literature on the Southeastern tribes as a primary ceremonial emetic served

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<sup>4</sup> On the institutional promotion of the Mediterranean Diet, see U.S. Embassy & Consulates in Italy (n.d.), The Mediterranean diet, <https://it.usembassy.gov/mediterranean-diet/>

at the Busk or Green Corn ceremony (Taylor, 1940, p.38). Michael introduced up to 28 plants he knew as remedies for wounds, coughs, colds and flu, diarrhea, and allergies.

This experience of place-tracking with a knowledge holder, Michael Orso, demonstrated a way of thinking about plants still growing outside, yet entangled with their connections to seed personhood, community identity, and well-being as relational data. This practice of so-called 'two-eyed seeing' characterizes the Indigenous ways of knowing. Two-Eyed Seeing is an approach of inquiry and solutions in which people come together to view the world through an Indigenous lens with one eye (perspective), while the other eye sees through a Western lens (Michie, Hogue & Rioux, 2018). Jayne Caroline Furness' cat's cradle games study concluded:

While many of the methods must be the same the world over, some of them will exhibit, in every region sufficiently isolated, marked peculiarities which, if enough figures are available, will enable us with certainty to recognize their locality. Thus, the methods of Caroline Islands figures cannot be mistaken for those of the Navajo Indians, or the New Guinea methods for those of the other two (p. 4).

Like Cat's Cradle's string patterns, which can be done in the same way but with different intermediate movements, Indigenous ways of knowing rely on place-based connectedness and reciprocal relationships.

### **Subaltern Knowledges, Dominant Narratives, and the Cat's Cradle Web of Resilience**

Across these three cases of partly or fully losing, altering, and maintaining TK, there is a recurring figure in the dominant cultural, political, and historical narratives. The Kazakh nomad is barbaric, rootless, resistant to civilization – a figure to be sedentarized, collectivized, modernized. The southern Italian peasant is backward, superstitious, trapped in magic and witchcraft – a figure to be industrialized and freed from the land. The Indigenous American is the "vanishing Indian" – a figure whose knowledge and territory belong to a past that modernity has already superseded. These are not incidental characterizations. They are, as de Martino (2017) argued, the ideological work that dominant systems perform on subaltern communities to justify their dispossession: rendering their knowledge illegitimate before extracting it, their territories empty before occupying them, their futures impossible before foreclosing them. They are, in Nixon's (2011) terms, a form of slow violence: gradual, dispersed, and systematically directed at the relational conditions through which people and land sustain one another.

The Soviet collectivization of Kazakhstan between 1929 and 1933 makes the lethal stakes of this ideological operation concrete. Forced sedentarization dismantled the seasonal migration infrastructure through which nomadic ecological knowledge was generated and transmitted across generations. Livestock – the living agents through which herders read weather, pasture, and seasonal timing were confiscated and slaughtered. Approximately 30% of the Kazakh population, between 1.5 and 2 million people, died of famine, disease, and violence during this period (Cameron, 2018; Elie & Ferret, 2017). The ideological narrative that enabled this destruction positioned nomadic knowledge not as a sophisticated ecological system but as a primitive obstacle to communism.

In the Italian South, the same subaltern operation took a different institutional form. The work of Ernesto de Martino, an Italian philosopher, historian of religions, and anthropologist provides the socio-political context for analyzing the role of women in preserving TK. In his “Towards a History of the Subaltern Popular World”, de Martino identified the reasons why the “ethnology and folklore have been tainted by naturalism” as a response of the dominant politics of modernization and exploitation of natural resources to the threat of the magical power of inexplicable (de Martino, 2017, p.65). De Martino’s Subaltern consider “colonial and semi-colonial peoples, as well as proletarians and peasants in the hegemonic nations” (p.63). His human-centered narrative excluded women, wolves and relationships between humans and non-humans which justified extermination of wolves in the Lucania mountain by the governing authority in the 1900s. Yet, this announcement masqueraded the rebels of mountaineers’ brigands against the capitalist economy. Industrialization of the Italian north forced farmers’ migration to the plains and coastal areas due to the large-scale redistribution of property rights favoring new landowning bourgeoisie, the bourgeoisie of *galantuomini* (Sereni, 1997, p.329). The de Martino erasing TK narrative was instrumental in manipulating the peasants when enforcing local economic development before it started to fade around the 1960s.

For the MOWA Band of Choctaw Indians of Alabama, the vanishing Indian narrative operated through cartographic as well as cultural erasure. Map-making is another way of constructing narratives silencing voices of marginalized communities. For more than 500 years, the maps of the United States supported the colonizer’s story, erasing the indigenous spaces for the purpose of their appropriation was a casual colonial practice. For example, Native communities were excluded from datasets collected by the U.S. Government about land management.

Soviet collectivisation of Kazakhs and subaltern representation of peasants in Italy echoes the stories of known colonial suppression traditional lifestyles of the MOWA Tribal Band of Choctaw Indians from Alabama, USA. The results of the inventory of the Choctaw-related archives and collections at the Smithsonian Institution brought to light documents and records of their existence as a tribal entity. The list of Choctaw clans produced by the Department of the Interior dated June 29, 1899 is among them. There are manuscripts of Choctaw Names of places, people, watercourses etc. in the old Choctaw country by Spratt and William and Choctaw legend of origin of corn by Swanton who worked with the Choctaw in 1928-1930, according to Bureau of American Ethnology-AR 46, page 3; and AR 47, page 2 (Manuscript, undated), Simpson Tubby, who is labeled as Choctaw and an informant in the archival record, drawn detailed river system of Choctaw Nation marked with villages for John Swanton (Manuscript, undated). Tubby’s ability to map the water sources characterizes his understanding of interdependence from his surroundings. In contrast, on the customized version the Choctaw territory has a note in French “il y a icy quantité de Sauvages and Villages don’t on ne scuit pas les noms” which means ‘there are a number of Savages and Villages whose names we don’t know’. The area on the 1722 historical map of Carolana and of the River Meschacebe was left blank despite the fact that it Cherokee, Choctaw, Chickasaw, Catawba, and Caddo occupied this territory. Swanton pointed to the knowledge of these inland

communities “after they came into contact with the whites,” specifically about their “adjustment to the environment,” which “was dependent in some measure upon the methods that have been evolved for exploiting it, notably the use of corn, beans, squashes, and a few other plants” (Swanton, 1946, p.21). The decline in Indigenous agricultural patterns after the development of reservations overlaps with the loss of biodiversity.

Indigenous farms became insufficient because of the impact of global warming and the change in food preferences and local skills due to the enforced removal of cultural values. Subsistence gardening practices among the MOWA Choctaw peoples who cultivated more than 50 varieties of crops, legumes, and fruits, as well as their foraging practices suffered from encroachment of the industrial agriculture sites: cotton and corn fields, Tung oil plantations, sweet potatoes, and pecan trees orchids, where parents or grandparents worked to make extra money. The intergenerational exchange of the TK preserved by elders was interrupted. However, Michael Orso reclaims the MOWA Choctaw identity by reconnecting to the land and traditions and owns his future by promoting the cultural values despite interruptions and erasures of their place-embedded narratives. Since 1960, Indigenous rights movements have accustomed maps for court cases to support their land claims (Castree, Kitchin, & Rogers, 2013). Map-making arguments can be useful to educate future generations, communicate with outsiders, and protect traditional knowledge.

The stories of Antonello Di Gregorio and the Three Sisters Garden highlight the role of local communities in preserving heritage seeds and traditional practices that have no political borders. The economic model of combined subsistence and commercial farming Indigenous communities developed to sustain their food sovereignty, promote resourcefulness and well-being, and then confront economic marginalization.

The cat's cradle mindset, held against this human-nature relationships history, reveals what the dominant narratives cannot account for: the strings did not break. In each case, communities subjected to inflicted epistemological violence sustained the relational logic of their knowledge systems under conditions designed to destroy it. Resilience, across all three cases, is not the capacity to preserve a traditional knowledge system intact. It is the capacity to maintain the web of reciprocal relationships with land, species, ancestors, and the more-than-human world through which knowledge is continuously regenerated. Reciprocity is not merely a cultural value added onto these knowledge practices. It is their epistemological structure; it is the condition under which knowledge is generated, the obligation through which it is transmitted, and the principle through which it remains adaptive, not static. What the dominant narratives called barbarism, backwardness, and vanishing was, in each case, a sophisticated system of reciprocal relationships that survived precisely because it was held not in institutions or archives but in the ongoing practice of attentive, embodied, communal life. The strings changed hands many times. The cradle held.

### **In Lieu with Conclusion**

This article contributes to emerging interdisciplinary discursive and material approaches associated with mapping relational knowledge values. Epistemological, ontological, and axiological commitments afforded a holistic analysis of the narratives about Kazakh nomadic knowledge; the relational foodways of Cilento farmers in southern Italy; and the land-based knowledge practices of the MOWA Choctaw tribal community in Alabama, USA. The article introduced the Relational Framework, which depicts the relationships among the components of interdisciplinary and participatory research as dynamic: they interact with one another and form new connections. Using the relational framework, our analysis revealed that Italian farmers, Indigenous communities, and Kazakh nomads shared the cat's cradle mindset and the connections to the land that holds collective memories. The narratives of TK from three continents illustrated the gap between the Western nature-culture concept and the cosmological worldview of Indigenous peoples, as well as the place-based traditions of Italian farming communities and Kazakh nomads. This interconnectedness of the multispecies web of land, seasons, animals, spirits, and community is what the dominant narratives have always tried to sever, and what these communities have always, in different ways, refused to relinquish.

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