When Traditional Knowledge Works: Social Mechanisms Of Ethnomedicinal Practice In Rural Philippines

Maria Salome A. Desoloc
College of Social Sciences, University of Rizal System,Pililla, Rizal, Philippines

Abstract: How does traditional knowledge persist in communities where biomedical healthcare is increasingly accessible? This question challenges assumptions that modernization inevitably displaces indigenous practices. This study examines traditional knowledge of *Alpinia elegans* C. (*Presl*) K. Schum, locally known as *tagbak*, in Infanta, Quezon, Philippines, to understand the social mechanisms through which ethnomedicinal knowledge maintains legitimacy and utility. Through sixteen months of ethnographic fieldwork with traditional healers, farmers, and community members, combined with phytochemical analysis, the research reveals that traditional knowledge operates not merely as medical information but as embedded social practice serving multiple community functions simultaneously. The plant addresses hyperuricemia (93% of informants), musculoskeletal disorders (60%), and various other conditions, while also functioning in agricultural pest management, nutrition, and ritual practice. Phytochemical screening confirmed the presence of bioactive compounds (flavonoids, saponins, sterols, glycosides, tannins) that support traditional therapeutic claims. The study demonstrates that traditional knowledge persists through cognitive and cultural embeddedness mechanisms—structured decision-making frameworks and trust networks—highlighting its relevance for shaping healthcare policies and conservation efforts. These findings contribute to understanding how communities maintain indigenous knowledge systems in contemporary contexts and have implications for integrative healthcare policy and biocultural conservation.
Keywords: traditional knowledge, ethnomedicine, social embeddedness, knowledge transmission, Philippines, *Alpinia elegans* C. (*Presl*) K. Schum

INTRODUCTION

Traditional medicine accounts for 60-80% of primary healthcare in developing nations (WHO, 2019), yet modernization narratives predict its inevitable displacement by biomedical systems. This prediction, however, has not materialized. In the Philippines, where over 1,500 plant species possess documented medicinal properties (Tan & Sia, 2014), traditional knowledge coexists with expanding pharmaceutical markets and government health programs. The persistence of these practices in contemporary contexts raises a sociological question: what social mechanisms enable traditional knowledge to maintain legitimacy and utility despite the availability of biomedical alternatives?

The question becomes more pressing given evidence of accelerating erosion of traditional knowledge (Dapar et al., 2020; Olowa et al., 2012). Environmental degradation eliminates plant resources, pharmaceutical penetration reduces demand for traditional remedies, and weakened intergenerational transmission disrupts knowledge transfer. Yet certain traditional practices endure. Understanding why requires moving beyond pharmacological validation to examine the social processes through which communities produce, transmit, and validate traditional knowledge.

This study addresses this question through an examination of *Alpinia elegans* C. (*Presl*) K. Schum, locally known as tagbak, in Infanta, Quezon Province. The plant presents an instructive case for several reasons. First, tagbak is not included in the Department of Health's approved medicinal plant registry, indicating that community validation operates

independently of state recognition. Second, the plant serves multiple functions beyond medicine—agricultural pest control, nutrition, ritual practice—allowing examination of traditional knowledge as multidimensional social phenomenon. Third, the plant's restricted geographic distribution (four remaining natural sites) highlights conservation challenges facing traditional knowledge systems.

The research objectives are threefold: (1) to document contemporary ethnomedicinal applications and sociocultural functions of tagbak; (2) to analyze social mechanisms through which traditional knowledge persists; and (3) to examine relationships between traditional therapeutic claims and biochemical properties through phytochemical analysis. The study contributes to social embeddedness theory by demonstrating how traditional knowledge operates as an embedded social practice with adaptive capacity and resilience mechanisms.

MAKING SENSE OF TRADITIONAL KNOWLEDGE: A SOCIAL EMBEDDEDNESS FRAMEWORK

Traditional knowledge systems resist straightforward classification as either "medical" or "cultural" phenomena. They encompass therapeutic practices, indeed, but also agricultural techniques, nutritional habits, ritual observances, and environmental management strategies. Understanding their persistence requires a framework that accounts for this multidimensionality.

Social embeddedness theory provides such a framework. Originally developed to explain how economic action is embedded in social structures (Granovetter, 1985), embeddedness theory has been refined to identify specific dimensions through which social practices maintain coherence and legitimacy (Zukin & DiMaggio, 1990). This study focuses on two interrelated dimensions particularly relevant to traditional knowledge systems.

Cognitive embeddedness refers to structured ways in which individuals process information and make decisions under uncertainty. In traditional medicinal contexts, cognitive embeddedness manifests through learned patterns of symptom recognition, treatment selection, and preparation methods transmitted through experiential learning rather than formal education. These cognitive frameworks provide decision-making heuristics that enable navigation of complex therapeutic choices without requiring biomedical understanding of causal mechanisms. A farmer who observes joint pain consistently treats it with tagbak tea, not because she understands its anti-inflammatory compounds, but because she has learned—through direct experience and social transmission—that this treatment typically produces relief within three days.

Cultural embeddedness encompasses symbolic meanings, beliefs, and social values that communities attach to practices, reinforcing group identity and social cohesion. Cultural embeddedness explains why traditional practices often persist even when biomedical alternatives are accessible, as these practices carry significance beyond therapeutic efficacy. They mark cultural authenticity, maintain intergenerational continuity, and create shared experiences that strengthen community bonds. When a traditional healer plants tagbak stalks at building corners to detect "lucky ground," the practice integrates practical plant knowledge (sprouting requirements) with spiritual belief systems to create a meaningful cultural practice that reinforces community worldviews.

These embeddedness dimensions operate synergistically to create what we term "knowledge persistence mechanisms"—social processes through which traditional knowledge maintains legitimacy and utility despite external pressures. Understanding these mechanisms is crucial for comprehending why certain practices endure while others disappear, and how communities adapt traditional knowledge to contemporary contexts.

The theoretical contribution lies in applying embeddedness theory to traditional knowledge systems, demonstrating how social embeddedness explains persistence and adaptation in ways that purely pharmacological or economic analyses cannot capture. Traditional knowledge endures not primarily because it works pharmacologically (though it often does), but because it is woven into cognitive frameworks and cultural systems that serve multiple community functions simultaneously.

RESEARCH DESIGN AND METHODS

Fieldwork Setting and Duration

This study employed ethnographic methods over sixteen months (September 2021-December 2022) in Infanta Municipality, Quezon Province, Philippines. Infanta was selected through purposive sampling based on documented traditional use of *Alpinia elegans*, relatively intact traditional knowledge systems due to geographic isolation, and community willingness to participate in collaborative research.

Research approval was obtained from the University of Rizal System Research, Extension, Development, and Production(RDEP). All participants provided written informed consent after receiving detailed explanations in Filipino. Community consent was also secured through consultations with barangay officials and traditional healers.

Participants and Sampling

The study employed purposive snowball sampling to identify key informants with specialized knowledge of tagbak. Initial contacts were established through the Local Government Officials and local health centers, which provided referrals to traditional healers and other knowledgeable community members.

The final sample comprised 16 key informants stratified across knowledge-holding roles: traditional healers ("albularyo", n=2), subsistence farmers (n=9), homemakers (n=4), and one physician (n=1). This sampling strategy captured diverse perspectives on the application of traditional knowledge. Traditional healers represented specialized practitioners with extensive ethnomedicinal knowledge. Farmers provided insights into agricultural applications and environmental knowledge. Homemakers contributed perspectives on household medicinal practices and intergenerational transmission. The physician offered comparative insights between traditional and biomedical approaches.

Informants ranged from 43 to 96 years (mean=62.8, SD=16.2), with 68.8% aged 60 or older, reflecting the concentration of traditional knowledge among elders. The gender distribution was 62.5% male, 37.5% female. Experience with tagbak varied from five months to 27 years (mean=8.7 years), indicating both long-term traditional practices and recent knowledge adoption.

DATA COLLECTION

Ethnographic interviews

Semi-structured interviews conducted in Filipino/Tagalog, lasting 60-120 minutes, covered five domains: personal history with tagbak, preparation and application methods, therapeutic indications and contraindications, sociocultural meanings and beliefs, and knowledge acquisition and transmission processes. Interviews were audio-recorded with consent and transcribed verbatim.

Participant observation

Extended observation documented tagbak collection, preparation, and application practices in naturalistic settings. Field notes captured contextual information that structured interviews might not reveal.

Geographic mapping
GPS coordinates were recorded for all identified tagbak growth sites to assess current distribution patterns and habitat characteristics.
Expert consultation
A licensed physician with rural health experience reviewed informant terminology and therapeutic claims to ensure accurate interpretation and facilitate translation between traditional and biomedical nomenclatures.
Botanical authentication
Plant specimens were collected following standard ethnobotanical protocols and submitted to the Institute of Biology, Jose Vera Santos Memorial Herbarium (PUH), College of Science, University of the Philippines Diliman, for taxonomic authentication.
Phytochemical screening
Leaf samples were analyzed by the Department of Science and Technology's Industrial Technology Development Institute (DOST-ITDI) following standardized protocols, targeting major secondary metabolite classes (alkaloids, flavonoids, saponins, sterols, triterpenes, glycosides, tannins).

Analysis
Interview transcripts underwent systematic thematic analysis using both inductive and deductive coding. Initial open coding identified emergent themes, followed by focused coding organized around cognitive and cultural embeddedness. Frequency distributions were calculated for reported uses, preparation methods, and therapeutic applications. Multiple data sources were triangulated to ensure validity. Member checking involved returning preliminary findings to participants for validation.

HOW TRADITIONAL KNOWLEDGE WORKS: EMPIRICAL FINDINGS

The Multiple Lives of Tagbak
Analysis reveals that tagbak functions as a multidimensional cultural artifact serving therapeutic, agricultural, nutritional, and symbolic purposes simultaneously. This multidimensionality is crucial to understanding its persistence. A plant that serves only medical purposes becomes vulnerable when biomedical alternatives appear; a plant embedded in multiple aspects of daily life maintains relevance through diverse pathways.
Therapeutic Applications
Hyperuricemia and gout management emerged as the most frequently reported therapeutic application, mentioned by 93.3% of informants (n=14). Traditional practitioners prepare tagbak tea by drying stalks, cutting them into uniform segments, and boiling for 10-15 minutes. The resulting red-colored decoction is consumed on an empty stomach, typically in the morning before physical labor. One farmer reported: "I have been drinking tagbak tea for two weeks while also dieting. The pain in my foot is gradually disappearing, and I plan to continue for another month to observe further changes."
This application demonstrates a sophisticated understanding of chronic inflammatory conditions. Practitioners recognize both acute symptom management and long-term therapeutic protocols, emphasizing dietary modification alongside herbal treatment—a holistic approach that integrates botanical medicine with lifestyle interventions.

Musculoskeletal disorders, including arthritis, rheumatism, and joint pain, were reported by 60% of informants (n=9). Treatment protocols mirror those for hyperuricemia, with practitioners typically reporting pain reduction within three days. This rapid response timeline suggests anti-inflammatory mechanisms warranting pharmacological investigation.

Dermatological applications encompassed diverse skin conditions. Impetigo treatment was reported by 20% of informants (n=3), who prepared decoctions from boiled sprouts with roots. Measles management was mentioned by 13% (n=2), while treatment of allergic dermatitis with direct leaf application was reported by 20% (n=3). These varied applications suggest broad-spectrum antimicrobial and anti-inflammatory properties.

Urinary tract infections were addressed by 27% of informants (n=4) using tagbak tea. Practitioners specifically noted the tea's red color as indicative of urinary cleansing properties, demonstrating a traditional understanding of bioactive compound indicators.

Gastrointestinal disorders, including stomach aches, were treated by 20% (n=3) using stalk decoctions. Traditional explanations emphasized the tea's function as a "stomach warmer" that strengthens intestinal mucosa, suggesting recognition of gastric protective mechanisms.

Agricultural Applications

Beyond medicine, tagbak serves crucial agricultural functions. Natural pest control was reported by 53% of informants (n=8), with farmers strategically planting tagbak near rice paddies to repel insects.

One farmer explained: "We plant tagbak around the rice fields. The insects don't like it. They stay away." This simple statement reveals traditional ecological knowledge about spatial arrangements and plant-insect interactions that enhance pest control in agriculture.

Nutritional Applications

Nutritional uses were reported by 73% of informants (n=11), who consume tagbak fruits raw for their aromatic, menthol-like flavor. This dual nutritional-medicinal function exemplifies what Heinrich et al. (2006) term "functional foods" that bridge nutrition and therapeutics. The fruits are not consumed primarily for nutrition or medicine, but for pleasure—a sensory experience that happens to carry therapeutic benefits.

Symbolic and Ritual Functions

Traditional knowledge of tagbak extends beyond pragmatic applications to encompass symbolic and ritual functions that reinforce cultural identity. "Luck detection" practices were reported by 60% of informants (n=9). This ritual involves placing tagbak stalks at the corners of the building lot before construction. If stalks sprout overnight, practitioners interpret this as a positive omen indicating blessed ground that will bring household prosperity.

This practice illustrates how traditional knowledge integrates practical plant biology (sprouting requirements) with spiritual belief systems to create meaningful cultural practices. The ritual serves multiple functions: it reduces anxiety during significant life transitions (such as building a home), reinforces community beliefs about land and dwelling, and maintains intergenerational knowledge transmission as elders teach younger members the proper ritual procedures.

Agricultural symbolism encompasses scarecrow applications reported by 93% of informants (n=14). Beyond practical pest control, tagbak stalks function as symbolic protectors embodying spiritual relationships between humans, plants, and agricultural productivity. One farmer stated: “The birds see the tagbak and they know not to come. It's like a guardian for the rice.”

WHEN KNOWLEDGE FACES LIMITS: CONSERVATION CHALLENGES

Global Positioning System (GPS)

GPS mapping revealed that tagbak currently exists in only four natural sites within the study area, all located near riverbanks and agricultural zones. This restricted distribution represents a significant reduction in habitat from historical accounts, which described a more widespread occurrence.

One traditional healer with 27 years' experience expressed concern: "Tagbak is gradually depleting." In response, he established a backyard cultivation plot serving both personal medicinal needs and community distribution for traditional healing practices. This individual conservation initiative demonstrates proactive community responses to environmental challenges threatening traditional knowledge resources.

The restricted distribution highlights a critical vulnerability in traditional knowledge systems: they depend on the sustained availability of biological resources. Environmental pressures, including deforestation, agricultural conversion, and climate change, pose threats not only to biodiversity but to cultural knowledge systems built around specific species. When the plant disappears, the knowledge attached to it becomes abstract, eventually disappearing as well.

Phytochemical Validation of Traditional Claims

Laboratory analysis confirmed the presence of five major secondary metabolite classes: sterols, flavonoids, saponins, glycosides, and tannins. Notably absent were alkaloids and triterpenes, indicating a specific phytochemical profile that may explain observed therapeutic activities.

Flavonoids demonstrate antioxidant and anti-inflammatory properties (Panche et al., 2016), providing potential mechanisms for observed efficacy in treating musculoskeletal and inflammatory conditions. Tannins exhibit antimicrobial and astringent properties that may explain dermatological applications and gastrointestinal protective effects (Chung et al., 1998). Saponins demonstrate immunomodulatory and antimicrobial activities (Hostettmann & Marston, 1995) that could account for anti-infective properties. Sterols including β-sitosterol, exhibit anti-inflammatory and cholesterol-lowering activities (Awad et al., 2000).

This phytochemical profile provides preliminary scientific validation for traditional therapeutic claims while indicating specific mechanisms warranting detailed pharmacological investigation. However, the social embeddedness findings suggest that traditional knowledge persistence depends more on cultural and cognitive factors than on biochemical validation alone.

Communities do not need laboratory confirmation to maintain traditional practices; they need social structures that transmit knowledge and cultural systems that give it meaning.

UNDERSTANDING PERSISTENCE: SOCIAL MECHANISMS OF TRADITIONAL KNOWLEDGE

The central finding of this study is that traditional knowledge persists through two interrelated social mechanisms: cognitive embeddedness and cultural embeddedness. These mechanisms explain not only why traditional knowledge endures, but also how it adapts to contemporary contexts without losing coherence.

Cognitive Embeddedness: How People Make Decisions Under Uncertainty

Traditional knowledge operates through structured cognitive frameworks that enable therapeutic decisions under uncertainty without requiring biomedical understanding of causal mechanisms. These frameworks include:

Symptom-treatment mapping

Practitioners develop systematic associations between observed symptoms and appropriate tagbak preparations. Joint pain consistently triggers the preparation of stalk decoction, while skin irritation elicits direct leaf application. These cognitive patterns enable rapid therapeutic responses based on pattern recognition rather than diagnostic complexity. A farmer does not need to understand inflammatory pathways to know that joint pain calls for tagbak tea; the association is embedded in cognitive frameworks transmitted through experience and social learning.

Dosage heuristics

Traditional practitioners employ experiential guidelines for treatment duration and frequency that adapt to individual responses. The common three-day treatment timeline for musculoskeletal conditions demonstrates shared cognitive frameworks that balance therapeutic efficacy with safety concerns. One informant explained: "You drink it for three days. If it's better, you can stop. If not, continue for a week. However, do not overdo it—everything has limits."

This heuristic reflects a sophisticated understanding that therapeutic response varies across individuals and that even beneficial treatments have optimal dosages beyond which harm may occur. The heuristic was developed not through randomized trials but through accumulated experience refined across generations.

Preparation optimization

Practitioners continuously refine preparation methods based on observed outcomes, creating adaptive knowledge systems that improve over time. The standardization of stalk-cutting methods and boiling times reflects collective optimization of preparation protocols. Multiple informants described identical preparation procedures—cutting stalks to specific lengths, boiling for 10-15 minutes, consuming before food—suggesting shared cognitive frameworks developed through collective learning.

These cognitive patterns matter because they enable communities to maintain therapeutic practices without requiring scientific understanding. The farmer who prepares tagbak tea cannot explain its anti-inflammatory mechanisms, but she does not need to. Her cognitive frameworks provide sufficient guidance for effective practice. This cognitive embeddedness creates resilience: traditional knowledge can persist even when scientific explanations are unavailable or contested.

Cultural Embeddedness: How Traditional Knowledge Maintains Social Meaning

Traditional knowledge maintains cultural legitimacy through interconnected social processes that extend beyond therapeutic utility:

Trust networks

Knowledge transmission operates through familial and community relationships characterized by high interpersonal trust. One compelling case involved a homemaker whose husband's knee pain improved with tagbak tea following a relative's recommendation. When she later experienced similar symptoms, she applied the same treatment with comparable success. She explained: "I saw it work for my husband, so when I had pain, I knew what to do. Moreover, I told my sister about it. Now she uses it too."

This narrative illustrates how shared positive outcomes strengthen trust networks, sustaining traditional knowledge transmission. Knowledge flows through trusted relationships rather than formal educational channels. The homemaker trusted her relative's recommendation not because of clinical trials, but because of relationship quality

and observed outcomes. This trust-based transmission creates resilience: traditional knowledge persists as long as trust networks remain intact.

Intergenerational transmission

Elder practitioners serve as knowledge repositories, actively teaching younger community members through apprenticeship-style relationships. Traditional healers reported regular consultations with community members seeking guidance on tagbak applications, creating ongoing opportunities for knowledge transfer. One healer stated: "Young people come to ask me about plants. I teach them what I know. If they remember, the knowledge continues."

This transmission process is selective rather than comprehensive. Knowledge passes to those who demonstrate interest and capacity, creating concentrated expertise among particular individuals rather than diffuse knowledge across entire populations. This selectivity may contribute to vulnerability—if key knowledge holders die before transmitting knowledge, it disappears—but it also creates expertise depth enabling sophisticated practice.

Cultural identity reinforcement

Traditional knowledge practice serve as markers of cultural authenticity distinguishing community members from urban populations increasingly reliant on biomedical systems. Multiple informants contrasted their traditional practices with urban lifestyles, noting, "In the city, they go to the pharmacy for everything. Here, we use what grows around us. This is our way."

This identity function creates social incentives for traditional knowledge maintenance beyond therapeutic utility. Maintaining traditional practices becomes a way of asserting cultural distinctiveness and continuity with ancestral ways. The practice validates community identity as keepers of traditional knowledge in a modernizing world.

Adaptive integration

Rather than rejecting biomedical alternatives, many practitioners integrate traditional and modern therapies complementarily. Several informants reported using tagbak treatments alongside pharmaceutical medications, viewing traditional medicine as "body cleansing" that enhances conventional treatment efficacy. One informant explained: "I take the doctor's medicine, but I also drink tagbak tea. The medicine treats the pain, but the tea cleans my system. Together, they work better."

This adaptive integration suggests resilient knowledge systems that accommodate rather than resist modernization. Traditional knowledge does not compete with biomedical approaches but complements them, finding new niches in therapeutic landscapes dominated by pharmaceuticals. This adaptability creates persistence pathways: as biomedical systems expand, traditional knowledge shifts functions rather than disappears.

IMPLICATIONS: WHAT TRADITIONAL KNOWLEDGE TEACHES ABOUT SOCIAL CHANGE

Theoretical Contributions

This study contributes to social embeddedness theory by demonstrating how traditional knowledge operates as an embedded social institution, transcending simple instrumental utility. Three theoretical insights emerge:

First, embeddedness operates multidimensionally through simultaneous cognitive and cultural mechanisms that reinforce each other. Traditional knowledge persists not merely because it works therapeutically, but because it is integrated into cognitive frameworks enabling decision-making under uncertainty, and because of cultural systems reinforce community identity. These dimensions are inseparable: cognitive frameworks gain

legitimacy through cultural embedding, while cultural meanings depend on cognitive patterns that make practices practically useful.

Second, embeddedness exhibits adaptive capacity enabling traditional knowledge systems to evolve rather than simply preserve historical practices. The integration of traditional tagbak therapies with biomedical treatments demonstrates how embedded knowledge systems can accommodate external innovations while maintaining core cultural functions. This adaptability challenges narratives of traditional knowledge as static preservation of ancestral practices. Instead, traditional knowledge systems are dynamic, continuously incorporating new information and adjusting to changed circumstances.

Third, embeddedness creates resilience mechanisms protecting traditional knowledge from erosion pressures. The trust networks, cultural identity functions, and adaptive integration patterns identified here suggest that embedded knowledge systems possess social buffers enabling persistence despite modernization challenges. This resilience does not guarantee persistence—as the restricted tagbak distribution demonstrates, environmental degradation can overwhelm social buffers—but it creates pathways to persistence that simple utilitarian models cannot explain.

RETHINKING TRADITIONAL KNOWLEDGE RESEARCH

These findings challenge purely pharmacological approaches to traditional medicine research by demonstrating that traditional knowledge systems operate as complex social phenomena that cannot be reduced to bioactive compounds or therapeutic efficacy measures. While phytochemical validation provides important scientific legitimacy, social embeddedness mechanisms suggest that traditional knowledge persistence depends more on cultural and cognitive factors than on biochemical properties alone.

This perspective has methodological implications. Studies that focus exclusively on compound identification or pharmacological validation may miss crucial social dimensions that determine whether traditional knowledge persists or disappears. Future research should adopt integrated approaches that examine social embeddedness alongside biochemical analysis to capture the full complexity of traditional knowledge systems.

The implication extends to development practice. Programs promoting traditional medicine often emphasize scientific validation as a pathway to preservation and revitalization. While validation has value, this study suggests that traditional knowledge persistence depends more on maintaining social structures—trust networks, intergenerational transmission pathways, cultural meanings—than on proving efficacy. Conservation strategies should therefore focus on strengthening social embeddedness mechanisms rather than solely pursuing pharmacological validation.

CONSERVATION AND POLICY CHANGES

The restricted geographic distribution of tagbak highlights critical conservation challenges facing traditional knowledge systems. These systems are vulnerable not only to cultural erosion but to environmental degradation, which depletes the biological resources on which traditional knowledge depends. When plants disappear, knowledge associated with them becomes abstract, eventually disappearing as well.

Conservation strategies must therefore address both cultural and biological dimensions simultaneously. Biocultural conservation approaches integrating traditional ecological knowledge with scientific conservation methods may offer more effective protection for both biodiversity and cultural knowledge than separate biological or cultural preservation efforts.

The backyard cultivation initiated by the traditional healer demonstrates locally-driven solutions that address both conservation and cultural preservation needs. Such community initiatives warrant policy support and funding mechanisms that could create scalable models for biocultural conservation. Rather than state-led conservation programs that may not align with community practices, supporting community-driven initiatives leverages existing social structures and motivations.

Policy implications include the need for integrated healthcare systems to recognize traditional medicine as complementary to, rather than competitive with, biomedical approaches. The adaptive integration patterns observed suggest that traditional and modern medical systems can coexist beneficially when policy frameworks support rather than marginalize traditional knowledge. Current policies often create competition: government health programs promote pharmaceutical use while marginalizing traditional practices, forcing communities to choose between systems. Alternative policies could support integration, recognizing that communities often prefer complementary approaches that use both systems, depending on specific circumstances.

CONCLUSION: MAKING INSTITUTIONS WORK THROUGH EMBEDDED KNOWLEDGE

This study began with a question: how does traditional knowledge persist in communities where biomedical healthcare is increasingly accessible? The answer lies in understanding traditional knowledge not as medical information but as embedded social practice serving multiple community functions simultaneously.

Traditional knowledge of tagbak persists through cognitive frameworks, enabling therapeutic decision-making under uncertainty and cultural systems, reinforcing community identity and social cohesion. These embeddedness mechanisms create resilience, enabling traditional knowledge to adapt rather than resist modernization pressures. Knowledge does not compete with biomedical alternatives but complements them, finding new niches in therapeutic landscapes dominated by pharmaceuticals.

Phytochemical analysis confirmed the presence of bioactive compounds, validating traditional therapeutic claims, but social embeddedness findings suggest that persistence depends more on cultural and cognitive factors than on biochemical validation. Communities maintain traditional practices not primarily because laboratories confirm efficacy, but because practices are woven into cognitive frameworks and cultural systems that serve multiple functions.

The restricted geographic distribution of tagbak highlights urgent conservation needs requiring integrated biocultural approaches addressing both biological and cultural dimensions. Community-based initiatives demonstrate locally-driven solutions that could serve as models for broader preservation efforts.

These findings contribute to social embeddedness theory by demonstrating how traditional knowledge operates as embedded social institution with adaptive capacity and resilience mechanisms. For development practice, the study suggests that traditional knowledge preservation depends less on scientific validation than on maintaining social structures—trust networks, transmission pathways, cultural meanings—that confer legitimacy and utility on traditional knowledge.

The study underscores the importance of recognizing traditional knowledge systems as valuable community resources providing healthcare access, cultural identity, and environmental stewardship. Rather than viewing indigenous and modern knowledge systems as competing alternatives, policy frameworks should support integrative

approaches that harness the complementary strengths of both systems for community benefit.

In the end, the persistence of traditional knowledge—like the persistence of effective local governance examined in earlier work (Saloma et al., 2013)—depends on individuals and communities who can radically rationalize existing practices, making them more closely align with social goals. Traditional knowledge persists not through preservation of fixed ancestral practices, but through continuous adaptation by communities engaged in problem-solving, finding ways to make existing knowledge work in contemporary contexts.

References

1. Awad, A. B., Roy, R., & Fink, C. S. (2000). *β-sitosterol, a plant sterol, induces apoptosis and activates key caspases in MDA-MB-231 human breast cancer cells*. Oncology Reports, 10(2), 497-500.
2. Chung, K. T., Wong, T. Y., Wei, C. I., Huang, Y. W., & Lin, Y. (1998). *Tannins and human health:* A review. "Critical Reviews in Food Science and Nutrition", 38(6), 421-464.
3. Dapar, M. L. G., Alejandro, G. J. D., Meve, U., & Liede-Schumann, S. (2020). Quantitative ethnopharmacological documentation and molecular confirmation of medicinal plants used by the Manobo tribe of Agusan del Sur, Philippine*s. Journal of Ethnobiology and Ethnomedicine*, 16(1), 1-35.
4. Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology*, 91(3), 481-510.
5. Heinrich, M., Ankli, A., Frei, B., Weimann, C., & Sticher, O. (2006). Medicinal plants in Mexico: Healers' consensus and cultural importance. *Social Science & Medicine*, 47(11), 1859-1871.
6. Hostettmann, K., & Marston, A. (1995). *Saponins*. Cambridge University Press.
7. International Society of Ethnobiology. (2006). International Society of Ethnobiology Code of Ethics (with 2008 additions). http://ethnobiology.net/code-of-ethics/
8. Olowa, L. F., Torres, M. A., Aranico, E. C., & Demayo, C. G. (2012). Medicinal plants used by the Higaonon tribe of Rogongon, Iligan City, Mindanao, Philippines. *Advances in Environmental Biology*, 6(4), 1442-1450.
9. Panche, A. N., Diwan, A. D., & Chandra, S. R. (2016). Flavonoids: An overview. *Journal of Nutritional Science*, 5, e47.
10. Saloma, C., Jayme Lao, M. E., & Advincula-Lopez, L. (2013). How to make local government institutions work: Some lessons on social change. *Philippine Political Science Journal*, 34(1), 83-96.
11. Tan, J. G., & Sia, I. (2014). *The best 100 Philippine medicinal plants*. Health Futures Foundation, Inc.
12. World Health Organization. (2019). *WHO global report on traditional and complementary medicine 2019*. World Health Organization.
13. Zukin, S., & DiMaggio, P. (1990). Structures of capital: The social organization of the economy. Cambridge University Press.