International Journal of Scientific Multidisciplinary Research (IJSMR)
Vol. 4, No. 5, 2026: 585 - 602

A Decade of Autopoietic Communication Evolution (2014-2024) Empowering Global Coffee Ecosystem: A Systematic Review

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A R T I C L E I N F O
Keywords: Niklas Luhmann, Autopoietic Communication, Function Differentiation, Coffee Ecosystem

Received : 09, March
Revised : 12, April
Accepted: 29, May

A B S T R A C T
This communication study seeks to identify the social interaction of coffee ecosystem between agricultural, extension, and business subsystem. The subsystem function differentiation creates agree or disagree decision among them in complex environmental changes. This study was compiled based on a database classification of journal articles with relevant and systematic literature topics such as the scope of sustainable coffee production to the impact of climate change, technology and coffee culture. The results on the article analysis with the perspective of system approach from Niklas Luhmann show that the autopoietic communication to the agricultural, extension, and business system is a reflection signal of information, utterance, and understanding the coffee ecosystem dynamics. Reflection of double contingency can be an alternative energy for the coffee ecosystem transformation much better.

INTRODUCTION

The coffee ecosystem influenced by two important factors, "red cherry" the main characteristic of coffee bean production and the way they are handled during harvesting, processing, distribution and consumption involving various systems (Mahdi, 2022; Michael & Smith, 2012; Teketay, 1999). A transformative communication encourages coffee innovation from upstream to downstream circulation, supported by good environment of capital, money, time, right tools, skilled labor, to processing, packaging, and marketing as a cyclic system. The coffee wave as a part of local adaptive power is connected globally as an energizing drink, a social lifestyle and an exchange of experiences, special and unique regional flavors (Leeuwis & Ban, 2004; Tucker, 2017).

According to *worldstatistic.net* 2024, Indonesia is a part of significant supplier. More than 9% of the word's coffee production, averaging 700 thousand tons per year, ranking 4th after coffee producers Brazil, Vietnam and Colombia. The Central Bureau of Statistic (www.bps.go.id) reported that export balance from year 2000 – 2023 averaged 400 thousand tons to major European country such as Germany, France, Italy, and the United State of America, as well as China, India, Japan, the Philippines, and Malaysia valued at 800 million US dollars. Global coffee production with various varieties of Arabica, Robusta, have potential values to be continuously developed through self-referential communication in every supporting system, of the global coffee ecosystem.

A study on various positive and negative responses as a part of self-referential communication to coffee ecosystem in the context of modern, critical, free, and empowered development communication is conducted within a broader framework of the vision and mission of the Sustainable Development Goals (SDGs) year 2015-2030. The systemic climate change adaptation research indicated that under projected climate for 2030 could have the greatest profitability in a relatively high rainfall site (Ghahramani & Bowran, 2018). The research gap emerge as the 12th SDGs suggests to ensure the sustainable coffee production and consumption. From this point, it is urgent to fill the gap with new perspective of communication not only by multistakeholder, message transmission but also the integration of new element of information, utterance and understanding.

The SDGs provide coffee ecosystem dynamics internally and externally system with opportunity to make choices or selection based on communication challenges optimizing the industry in a sustainably positive way and at the same time reduce conflicts of interest took place. The relationship between coffee ecosystem contributes to the culture in industry, including system interconnection, innovation and infrastructure, healthy and prosperous living, responsible production and consumption, economic growth, availability of jobs and fair income (Inagaki, 2007; Kurniawan, 2023; Leeuwis & Ban, 2004; Mefalopulos, 2008; Mody & Gudykunst, 2002; Nora Cruz Quebral, 2012; Rogers, 2003).

THEORETICAL REVIEW

The coffee ecosystem consists of complex constituent systems, including agricultural, extension, and coffee business system. Changes in any of these

systems, can affect the entire coffee ecosystem and also the environment locally, globally (Ashardiono & Trihartono, 2024). Coffee farmers as a primary component of the agricultural system often become directly affected party when there are issues emergence related to climate changes, competition, market prices, or conditions in their farming fields. Limited access to infrastructure, capital, training and technology, makes cost of production, distribution, and consumption knowledge less efficient. The crucial point lies in the problems of communication pattern within coffee ecosystem in responding changes in order to adapt, each of agricultural, extension and business coffee system use their own references. The pattern is recognized as a direct expression through statement that can trigger agreement or disagreement even conflict due to the ego of each system's opinion (Iwan et al., 2022).

As far as we trace, the identifying responses through communication in the coffee ecosystem can produce new insight until each system gained a specific quality of communication. Which parts of the system are already ideal, which are expectations, misunderstandings, and various things that need to be promoted for further communication. However, the process of communication selection affects the continuity of integral system along with expression, information, and shared understanding within the coffee ecosystem cycle. The integration of information, utterance and understanding is the new perspective of communication (Baraldi et al., 2021; Lee, 2000; Luhmann, 1992). The relation between coffee farmers, processors, the government, business actors, and the coffee community mutually responds and influences the coffee ecosystem with various dynamics communication code, such as push and pull, regulation or coercion, profit or loss, transformative or not, agree or disagree, supply and demand still need to be observed.

This study aims to observe the trends and the challenges in coffee ecosystem as communication problem from 2014-2024 by comparing how each subsystem communicates and responses. This perspective can be used to observe and explain what and how the phenomenon on coffee ecosystem to encounter double contingency. Through good or bad responses, internal system could increase the sensitivity achieving substantive communication (Berghaus, 2011). From this point, the coffee ecosystem components; from agricultural system, extension and coffee business system can also self-manage, both positive or negative responses as an alternative and fresh energy to empower the coffee ecosystem.

METHODOLOGY

This communication study is conducted using a SLR-Systematic Literature Review. It is relevant to research goal by comparing articles of social interaction in coffee ecosystem 2014-2024. First, we scope topics based on Luhmann's theoretical framework about double contingency with keywords: "coffee ecosystem", "autopoiesis", "sustainable coffee", "system adaptation", and "self-referential communication" as shown in figure 1. Second, collecting articles data technique utilized (PP) Publish or Perish version 8.0 application. Third, finding

double contingency phenomena within the articles then analyze it evaluate and conclude.

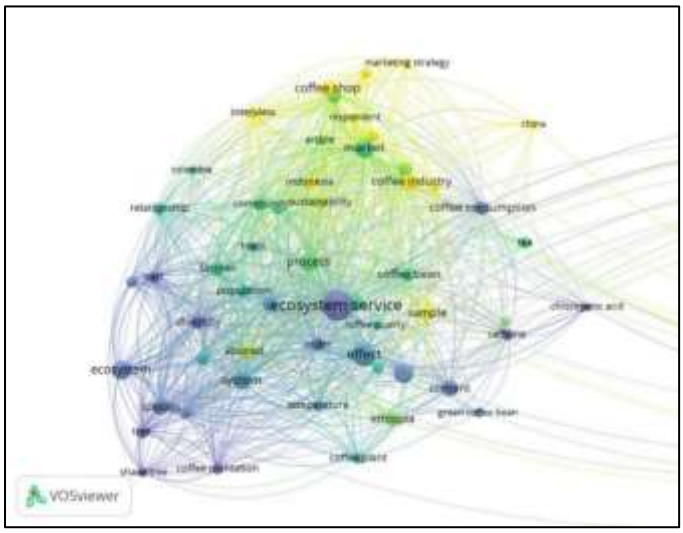

Figure 1. Coffee ecosystem scope visual mapping

Utilizing Publish or Perish version 8.0 application, a total of 1.000 articles were selected through a cross-reference procedure. Only 11 articles met the inclusion criteria according to the keywords used. Several parts of books, proceedings, and monograph that not relevant to the double contingency were excluded. Diagram 2 bellow shows articles selection, sorting and final selection.

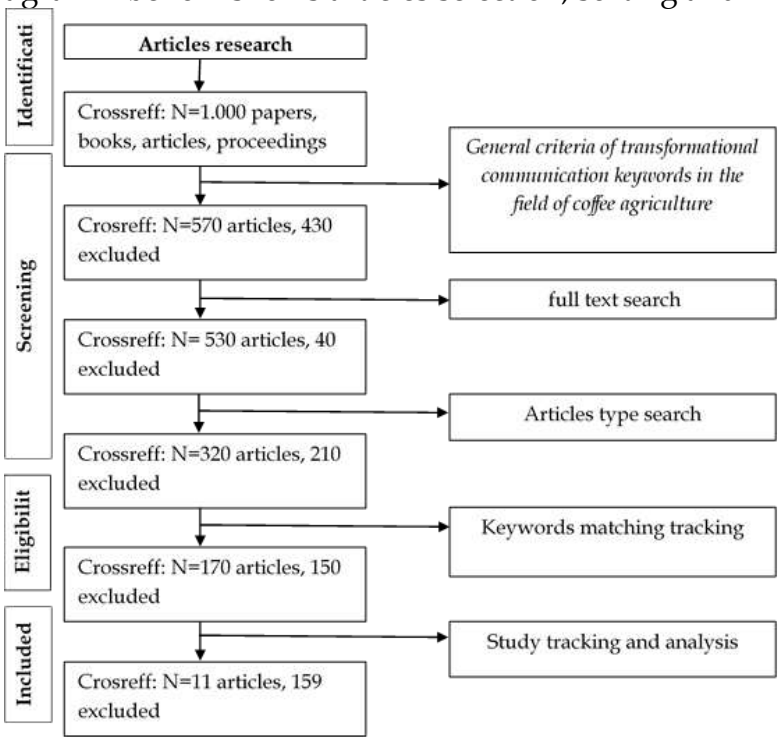

Figure 2. Research data collection technique

RESULTS

After reviewing selected articles, the majority of which were based on research from the Netherlands, the United States, Australia, Africa, Indonesia,

and Vietnam. Regarding the year of publication, the articles were traced for the period of 2014-2024. Mostly, the research samples consist of triadic relationships between the quality of agricultural systems, extension services, and businesses that communicate each other and found to be responding to one another. Thus, we next to find double contingency phenomena within the articles.

The indicators of double contingency and to look deeper from articles come from discussions between systems within coffee ecosystem, primarily agricultural system, extension services and coffee business system as presented in table 1. The next step is to analyze the content inclusion criteria, within the substance of the articles presented in a table 2.

Table 1. The double contingency indicator for guiding through selected articles

No	Ecosystem	Communication	Responses
1	Agricultural	Knowledge, skill in coffee farming, planting, fertilization, post-harvest, processing, roasting to coffee brewing.	Group dynamics with learning activity, collaboration, commodity offerings, roastery, exhibition and coffee shops
Double contingency between coffee agricultural system and extension service requires a willingness to act. Producers expected extension agent to provide practical and updated issues on planting to harvesting. Extension agent wishes coffee farmer adoption their literation on training and practicing recommendation. Both of them can share coffee agricultural standard norms to gain quality or sustainability.			
2	Extension	The frequency of visit, facilitation of extension services, development communication through system and the completeness of service infrastructure.	Extension materials, discussion, adoption and training management, field school from various department of agriculture, cooperative, upstream to downstream coffee industry.
Extension services and business system into double contingency if expecting and supporting sustainable practices. Business will expect extension services to support producers and ensuring always meet coffee markets standard. Joint program, training or policy frameworks can be used to avoid barrier of communication.			
3	Business	Formulating coffee branding activities, business forum, licensing, access to global coffee industry.	Brand identity, coffee consumer community, marketing, selling, exhibition, coffee house production.
The subsystems like buyers, consumers, roasters, sellers, will a lot to expect consistent and more supply from producer with good standards or high standard quality. While producer in return will expect fair payment with good and stable demand. The negative or positive phenomena rising about contract, certification, fair trade, price signal.			

Table 2. The summaries of articles tracking N=11

No	Inclusion Criteria	Findings
1	Collaboration of independent group of farmers in the intercropping agricultural system in Australia.	Adaptation selection options for climate change in agricultural systems up to 2030 support the economic aspect remaining good (Ghahramani & Bowran, 2018).
2	The participation of government extension workers and academics lead to a broader natural and environment ecosystem	Transformative participation emerge in critical areas such as irrigation, water management, food security, funding and research (Loghmani-khouzani et al., 2024).
3	The drive for relationships and mutual understanding from external media system into face-to face learning in agricultural systems.	The changing communication platform transforms the agricultural learning process in digital literacy, requires special equipment and the right timing (Staden et al., 2022).
4	Independent initiatives by farmers within the agricultural systems in carrying out optimal activities in their own agricultural systems.	29 out of 171 agricultural ecosystems in Netherlands show integrated cyclical technology optimization and anticipation of social changes (Hoogstra et al., 2024).
5	The agricultural extension system and the business world facilitate dialogue and non-dialogue that produce different responses.	Live demonstrations trigger cognitive conflicts in agricultural fields, reflecting reinforcing the learning process and new information that can be easily applied in the field (Cooreman et al., 2021).
6	The agricultural system in collaboration with mixed crop livestock and business strive to create added value from utilization of civet animal.	The collaboration among coffee farmers in Lampung Sumatra utilizes civet cats through business system to optimize the added value of their coffee production (Iwan et al., 2022).
7	The coffee supply chains require appropriate responses at every stage from production to consumption.	A careful attention to coffee quality from cultivation, processing to distribution affect the health benefit of coffee consumption (Viana et al., 2024).
8	The agricultural system is trying to respond to climate change but receive a little pull or less demand response from downstream business systems.	Sustainable Transformation in Agricultural (STA) shows a large gap between decision makers and implementers at the Vietnam local level, not well addressed in the end of chain (Huynh et al., 2023).
9	A social system with the heart of communication has the	Food system and agricultural environments express the complexity of

	power to transform culture, economy at various level.	hopes for health, enjoyment and changes (Singer & Kristiansen, 2023).
10	Collaboration between government, NGOs, business system provide intervention to be adopted in order to increase coffee agricultural productivity	Intervention policies in Malawian agricultural communication have not been entirely successful. Unless been tested, proven by expert, and originated local farming communities (Kanchewa et al., 2020).
11	The government is building a payment system for the best agricultural practice documents with the hope that farmers will use it.	Supporting networks, education level, and financial capacity are the main factor behind the low access to BMP services in Florida, America (Rampold et al., 2020).

Our findings demonstrate what Luhmann said about new perspective integration between information, utterance, and understanding (Luhmann, 1992). Our data shows that all systems in the coffee ecosystem respons and resonate to one another basically as an endless process. Taken together, this findings imply that "what is communication" as Luhmann said earlier beyond just a classic message transmission that information, utterance and understanding among the systems may empower the coffee ecosystem to adapt the environmental changes.

DISCUSSION

The articles review gives us information that various changes to avoid uncertainty in the complexity of modern society's coffee ecosystem and its environment require adaptation responding through communication. What is communication? Sociologist Niklas Luhmann offers "autopoietic system" a new perspective in social system without human involvement. A selection of information, utterance and understanding that arises together in self-creation self-maintenance. There is a process of sorting, choosing, and state those communication's components clearly. Not making selection means there is no communication. Only communication can communicate and maintain the system (Luhmann, 1992).

A system is complex but not complex more than its environment. When the systems communicate to reduce their own complexity, to their environment or other system that have more complexity, it must have a complexity that distinguishes itself from the environment (Hardiman, 2008). The complexity of the environment can be re-observed and simplified through the flows of quality information, which also change as an expression of a transformative communication for understanding the system that make up the entire coffee ecosystem involved and reduce contingency.

According to Margit Neisig, re-examining the responses of the can reveal the specific quality of social system, in this case coffee ecosystem. Which responses are already ideal, in efforts to maintain and develop the dynamics of each system and the whole ecosystem can move to the next transition. How the

people in the system communicate, how they manage their own self-creation or self-maintenance? Which parts still hold potential and hope, what has been agreed upon, and what about those who do not agree, misunderstanding, and various communication efforts that are continuously pursued in contingency. After that, things can serve as drivers to be communicated and expressed into a social functional communication circulation (Neisig, 2017).

Contingency is uncertainty. In social interaction, the coffee ecosystem depends on what they expect to each other. It is double contingency while the other system also has their own expectation. To phrase what Margit Neisig said earlier, both sides are uncertain. This condition creates a loop of interpenetration to mutual or parasite dependency. System looks like black box mechanism, without stabilizing communication can collapse into uncertainty (Neisig, 2017). Luhman notion that only communication itself can stabilize the uncertainty. Not eliminating it, but manage double contingency between each system in coffee ecosystem. By continuing share each code and system norm, the ecosystem will reduce uncertainty. The ecosystem can provide predictable expectation and gain common meaning understanding (Holmström, 2007).

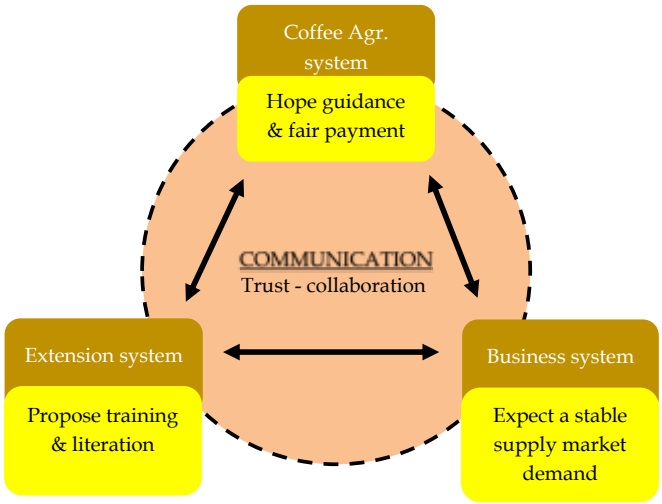

Figure 3. Managing uncertainty through communication

At the center of diagram 3, we intend to propose mutual communication to stabilized when double contingency occurred. Tackling the uncertainty to manage the communication so it can continue. Conflicts within environmental changes can occur and difficult to avoid over time. Through communication, every response is managed and stabilized as internal process for the system to adapt resolves its own issues. We imagine communication phenomena and its contingency between each system in global coffee ecosystem could reorganize as triadic intersystem between coffee producer and extension service, coffee producer and business system, extension service and business system.

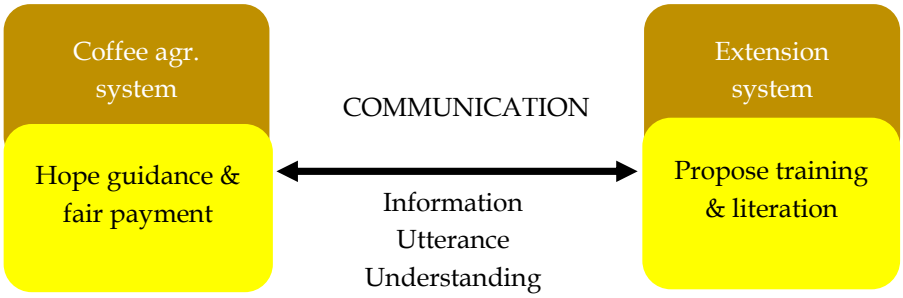

Figure 4. Double contingency between producer and extension service

Double contingency between coffee producer and extension service requires a willingness to act. Producers expected extension agent to provide practical and updated issues on planting and harvesting. Extension agent wishes coffee farmer adoption their literation on training and practicing recommendation. Both of them can share coffee agricultural standard norms to gain quality or sustainability and help manage uncertainty.

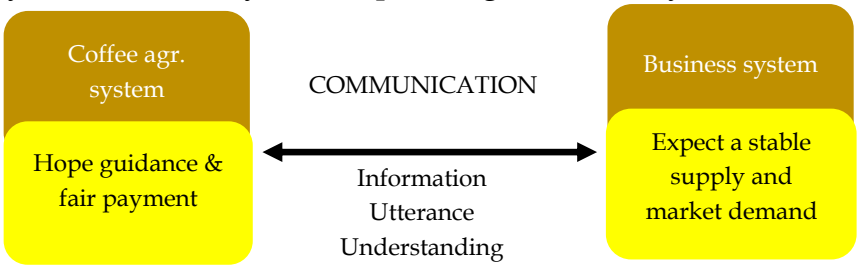

Figure 5. Double contingency between producer and business system

The subsystems like buyers, consumers, roasters, sellers, will a lot to expect consistent and more supply from producer with good standards or high standard quality. While producer in return will expect fair payment with good and stable demand. The negative or positive phenomena rising about contract, certification, fair trade, price signal.

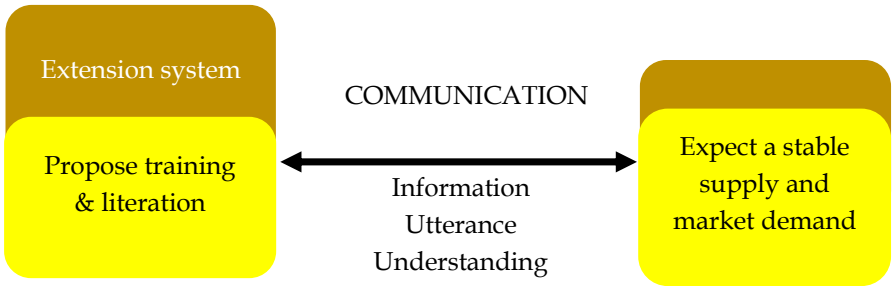

Figure 6. Double contingency between extension service and business system

While extension services and business system into double contingency if expecting and supporting sustainable practices. Business will expect extension services to support producers and ensuring always meet coffee markets standard. Joint program, training or policy frameworks can be used to avoid barrier of communication.

In poly contextualities like coffee ecosystem above, double contingency occurred everywhere every time. In these diagrams 3-5, Luhmann's idea looks

like become understandable. Communication should be the one to stabilizing the all system through trust each other, for long term relationships between producer, extension and business system. Each function system could use their boundary system to strengthen cooperation, collaboration or contracts. To maintain mutual relation and avoid parasite or sectoral ego between them, the code must be respectfully to transform quality, sustainability and legality. Every relation in the ecosystem is uncertain until communication creates stability (Holmström, 2007). The system's ability to adapt, or to respond, and also resonate with the environment, become increasingly sensitive to every change within the system as well as external factors. Its impact can serve as a strategic foundation especially for the coffee farming community to adapt, and respond to environmental changes.

Communication is a matter of choice in the current development of modern society. It is the choice of what becomes an information, utterance and understanding as actions within an integral social system (Luhmann, 1992). The dynamics of the coffee ecosystem, after responding to various systemic issues and being considered by many as successful, may actually be seen as experiencing a decline from the perspective of its internal system or other external factors. The measurement of a system achievement towards better quality is always accompanied by efforts to simplify existing complexities in order to sustain and grow (Neisig, 2017). The challenges in the coffee ecosystem dynamics that emerge in the articles discussion further reinforce the view and dominance culture of a consensus and tendency to eliminate different communication expression. In fact, not agreeing is a signal that a new change in the system will be needed soon to adapt or respond environmental changes.

There is no transmission or communication of messages and systemic responses in the coffee ecosystem. This new perspective requires sensitivity and trains the system's own sensitivity to continue living (Luhmann, 1992). Without actors, communicators, even communicans, as seen in the personification of coffee farmers, agricultural extension agents, to coffee business managers, the ecosystem becomes a relation between systems that support coffee ecosystem as a whole (Hardiman, 2008). Alter and ego is a substitute name for all of us as actors or communicators. The coffee farming system therefore consists of internal communication process ranging from the memories of coffee history, through a very noisy and busy social media system not only about coffee but also linking to almost all social life issues (Luhmann, 1992). The possibility of this article observation goes beyond not only transferring the messages, it provides a transition to proceed mindsets shifting, coffee farmer community empowered, and promote the changing system and environment.

When a current coffee issue arises, brought up, expressed, articulated, stated, does it become communication along with information and understanding (HI Wahyuni, 2024). Without expression or clear articulation, the coffee issues can be forgotten, misunderstand, and remain merely a part of psychic awareness, rather than being a part of actual existence of the social coffee ecosystem. Observing every internal and external response between the coffee farming system, extension services, and the coffee business can stimulate new

information that is reprocessed to discover surprises, to discover new or different things, and inevitably sharpen the system to become increasingly sensitive and perceptive, leading to the growth of transformative and quality of communication (Iwan et al., 2022).

Information terminals in the articles media system from year 2014-2024 in tracking previous writings, one of which revealed misunderstandings and misconceptions. Once again, what is discussed in the closed coffee farming system, which is also opened when responding to its environment, cannot always be understood by extension services or businesses system. The true meaning is not well connected as an intersystem relationship that need each other, especially if this misunderstanding concerns issues about trust(Holmström, 2007). What is expressed and offered by extension and business system and vice versa, ultimately does not receive proper response because it is not a need of the system to accept and process it. The insensitivity of the system results in rejection or silence, causing the growth and system development to encounter invisible obstacle because each system defending their own ego.

An important goal of communication in today's modern society is to increasingly develop sensitivity to its own systems, in order to live and continue well both communally, organizationally, and publicly (Luhmann, 1992). Daniel Lee emphasizes Luhmann perspective that the system does not recognize individual, actors, communicators, or humans, but rather their two communicative alter ego actions, which processed into utterance's expression, information, and understanding as an integral manner. The world of systems can only be detected and operated through communication as the core of the social system – autopoiesis, refers to and maintains the life of its own system (Lee, 2000). It cannot be denied that the inclusion criteria in the previous article tracking revealed many negative responses resulting from the uneven interactions between systems, which responded based on their own system's ego rather than actual need. The way people communicate systemically becomes a reflection of the problems of modern society, especially within today's coffee ecosystem.

A good and appropriate response is needed in the development of communication within the transformative coffee ecosystem. Instead of misunderstanding each other, choosing to communicate cautiously with selection of positive communication can encourage a better shift in understanding. For example, in article's discussion in the African country of Malawi. Although it is well known as one of the long-standing coffee producers, the community of coffee farmer does not fully trust the recommendation from the government extension agents or coffee entrepreneurs until they are proven by experts they trust or because they adhere their local wisdom. Push and pull of this kind of interest certainly affect the energy within the system, as well as the coffee ecosystem as a whole. The difficulty in grasping the useful meaning in this case is partly due to a lack of sensitivity to local wisdom issues or the failure to utilize the energy responses of other systems from experts trusted by the local coffee community. If one lack of sensitivity, they get caught up in the commotion

of the coffee communication itself and each system adheres to its own code (Holmström, 2007).

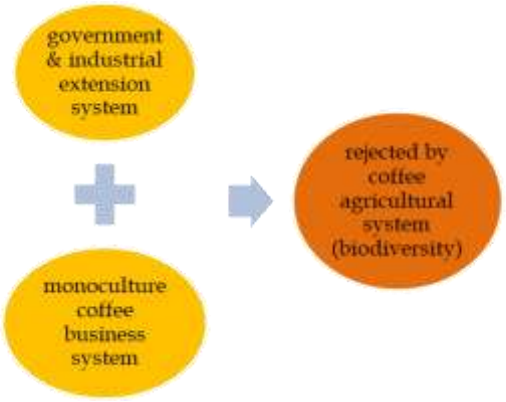

Figure 7. Communication with different response

Calling the noises, accepting or acknowledge the differences ultimately requires the maturity of the society itself. The success and the failure of a system depend on the system itself to survive and thrive. As a result of communication like the Malawian coffee ecosystem in diagram 6, cognitive conflicts or other risks may occur which can be positive signal, honest, and even become a blessing if managed, not ignored or suppressed. Change is inevitable phase that need to be embraced as a balance for sustainability. One of the unique mechanisms supporting sustainability is by paying attention to local wisdom that it is not found in other system, which is then detected as a difference system function that is indeed different and cannot be equated (Hidalgo et al., 2023). Risks factor when pressured, or eliminated, eventually the system only circulates in a saturated manner, stagnant, unable to demonstrate the optimal performance differences that complement one another in the of coffee ecosystem. Thus, it would be better each system practices letting go of its sectoral ego and experiences working together based on their respective uniqueness, collaborating and caring to make a positive impact in the coffee ecosystem.

An important lesson about what communication is from this new perspective is not about reaching and getting consensus, especially in the relationships between agricultural system, extension services, and businesses. Consensus or dissensus, negative or positive, agree or disagree could become a signal of autopoiesis. Tracing to what Niklas Luhmann's view, Hermin shows that the offer of autopoietic communication, referring to the system itself. It is a form of appreciation and trust, because differences can generate different and more positive responses through continuous exploration. Although ecosystem complexity is increasing, each supporting system still strives to reduce and simplify itself, becoming more and more sensitive to the changes of itself and environment (HI Wahyuni, 2024). The main aspects of understanding the production, distribution and coffee consumption can also pay more attention to the environmental changes. Although conflicts of interest are inevitable, through good or bad responses, communication expressed continuously become part of endless evolutionary change and together with coffee ecosystem, it gives meaning to its sustainability.

Changes, from this new communication perspective goes beyond mere message transmission. Therefore, the way coffee communities respond to themselves and their environment should not be burdened with moral judgment of right or wrong as this could disrupt the expected smooth and normal flow of communication. Communication barriers due to pressure or tension can disrupt the life of coffee ecosystem. A system that is considered to be successful is a system that can maintain, keep the system alive, reduce complexity as it becomes more sensitive, face itself and environment in two opposing ways as a combined response that enlivens, opposed as a form of adaptation. Budi Hardiman states that a system failure can occur when communication becomes insensitive, dose not adapt well, and fails to respond to changes in itself, and its environment, resulting in communication pathology (Hardiman, 2008). Embracing this thought, more practices will be needed and driven by coffee farmer community discussion ethically rather than from extension services and business system advisories.

Ethics within the systems of agriculture, extension service, and the coffee business, alongside the dominance and influence from political and economic system, culture and religion system, need to restrain themselves within their own limits and ego so as not to become a sector egocentric during their growth and development. As Susanne Holmstorm's support in Luhmann's systemic thinking, broadly increasing trust and more positive understanding not only fosters positive and negative responses but also patiently manages them over time and change, progressing towards better outcomes and continuously improving while still reducing risks and complexity (Holmström, 2007).

Thus, communication can continue, be maintained and the system can still function even when misunderstandings, potential conflicts, tension or strain, and difference opinion occur, which make communication a hallmark of modern societal problem (Lee, 2000). Without selection of information, utterance's expression and understanding the communication process is impossible. Coffee issues and topics must continue to be discussed continuously until quality and sensitive communication is achieved, different alternatives are created, and a significant impact felt on the coffee ecosystem over the expected time and changes. The diagrams above visually map how double contingency happened in the global coffee ecosystem. It shows to us the communication loop and trust can boost communication into collaboration between coffee agricultural system, extension service and business system.

CONCLUSIONS AND RECOMMENDATIONS

The articles tracking from year 2014-2024 observing inclusion criteria how the system communicate from agricultural system, extension services, and business within the coffee ecosystem as well as the discussion conducted reveal three important findings. First, detecting double contingency communication in coffee ecosystem based on Luhmann's perspective create a portrait of stagnant system conditions unable to circulate normally. Some system within ecosystem saturated routines like system responses making communication tension difficult to develop. The communication circulation from agricultural system, extension services, and business within the coffee ecosystem is trapped in the same and

repetitive relationship in every operation, becoming obstacles both internal and external pressures on the system, much of them come from the environment and climate change.

Secondly, as one of the supporting systems for coffee ecosystem, particularly regarding the independence of coffee farmer communities are beginning to find alternatives to respond positively for the sake of their own system. The agricultural system is taking advantages from the government extension agents or business system to transform or not to transform the upstream coffee chain towards downstream coffee industry with commercial aspect and various aspects demand and supply. Third, in addition as an advance stage of coffee communication evolution within internal farming system, a small community of coffee farmer has emerged who choose not to transform towards to the coffee industry. This condition can also be considered as a specific recommendation to coffee farming systems that do not have sufficient multimodal. The sustainability of coffee farming system involves to put aside the logic of profit or loss, and the developing sensitivity to social and natural environment by nurturing and respecting their diversity, including rejecting coffee monoculture and preferring diversification alongside mixed crops-livestock coffee farming in the surrounding area such as Malawian Agriculture.

The implication of this study from new communication perspective reaffirms the novelty that still leaves room for broader study. Communication occurs when various information, utterance expression, can be understood integrally without the involvement of individual, actor or human and because social systems have different boundaries physical, biological and psychic system. The social reality is essentially a synthesis of the new communication components namely information, utterance, and understanding. It does not matter who communicate to whom anymore, the integration of the new components that matter. Using new communication perspective is challenging. The extreme differences compared to previous experts who still viewed it as messages delivery or transmission through media and received by communicant. Inevitable consequence is the increasing number of alternatives, perspectives, and references that feel new and different. How ever to demonstrate and explain it further exploration is necessary.

FURTHER STUDY

Other systematic literature review needs to be continued to explore various systems beyond agriculture, extension, and business which are the dominant inclusion criteria shaping the current coffee ecosystem. It is very interesting when there will be a comparison or discussion in the relationship between political, economic, legal, artistic, or coffee culture system and encouraged to be continuously communicated again as a way to enrich knowledge and become increasingly sensitive to environmental changes for example shifting from commodity to coffee lifestyle and specialty. The important lesson here is that the coffee farming system does not always agree as a response sustaining itself, especially if it has biodiversity or local wisdom. The pull or push from extension or coffee business system towards modern industry has no

effects, even though both perspective of this system considered it to be honesty and goodness of interest for the coffee farming system.

ACKNOWLEDGMENT

This work was supervised by Research Ethics Committee of Universitas Gadjah under Protocol No. KE/UGM/121/EC/2025 ethical clearance and we declare no potential conflict of interest in this study. We are grateful to the Ministry of Higher Education, Science, and Technology of Indonesia for awarding the dissertation research fellowship program for supporting this publication. The authors also thank to the anonymous reviewers for their insightful comments and miss Y.P. for her professional proofreading which significantly improved the article.

REFERENCES

Ashardiono, F., & Trihartono, A. (2024). Optimizing the potential of Indonesian coffee : a dual market approach. *Cogent Social Sciences*, *10*(1). https://doi.org/10.1080/23311886.2024.2340206

Baraldi, C., Corsi, G., & Esposito, E. (2021). *BiUP General*. the Deutsche Nationalbibliothek Bielefeld University Press. https://doi.org/https://doi.org/10.14361/9783839456743

Berghaus, M. (2011). *Luhmann Leich Gemacht Eine Einführung in die Systemtheorie*. Böhlau Verlag GmbH & Cie, Köln Weimar Wien. http://dnb.ddb.de/

Cooreman, H., Debruyne, L., Vandenabeele, J., & Marchand, F. (2021). Power to the facilitated agricultural dialogue : an analysis of on-farm demonstrations as transformative learning spaces. *The Journal of Agricultural Education and Extension*, *27*(5), 699–719. https://doi.org/10.1080/1389224X.2021.1969958

Ghahramani, A., & Bowran, D. (2018). Transformative and systemic climate change adaptations in mixed crop-livestock farming systems. *Agricultural Systems*, *164*(July), 236–251. https://doi.org/https://doi.org/10.1016/j.agsy.2018.04.011

Hardiman, F. B. (2008). Kebaruan Teori Sistem Niklas Luhman. *Jurnal Filsafat Driyakara*, *3*(xxix), 1–15.

HI Wahyuni. (2024). *Komunikasi Autopoiesis Sebuah Pengantar Memahami Perspektif Sistem Niklas Luhmann*. Gadjah Mada Universty Press Yogyakarta. https://ugmpress.ugm.ac.id/en/product/sosial-humaniora/komunikasi-autopoiesis-sebuah-pengantar-memahami-perspekstif-sistem-niklas-luhmann

Hidalgo, F., Ruiz, X., Birkenberg, A., Daum, T., Birner, R., Hirsh, P., & Bosch, C. (2023). Digitalization Sustainability and Coffee Opportunities and Challenges.pdf. *Agricultural Systems*, *208*.

https://doi.org/https://doi.org/10.1016/j.agsy.2023.103660

Holmström, S. (2007). *Niklas Luhmann : Contingency , Risk , Trust and Reflection*. *33*(3), 255–262. https://doi.org/10.1016/j.pubrev.2007.05.003

Hoogstra, A. G., Silvius, J., Olde, E. M. De, Candel, J. J. L., Termeer, C. J. A. M., & Boer, I. J. M. De. (2024). The transformative potential of circular agriculture initiatives in the North of the Netherlands. *Agricultural Systems*, *214*(July 2023), 1–17. https://doi.org/10.1016/j.agsy.2023.103833

Huynh, N. M., Sang, L. T., Coleman, M. J., Lien, L. T. H., & Kristiansen, P. (2023). Fostering sustainable transformative adaptation and value chain development in agricultural systems in response to climate change. *SSRN Electronic Journal*, *1*, 1–26. https://doi.org/https://doi.org/10.2139/ssrn.4664087

Inagaki, N. (2007). *Communicating the Impact of Communication for Development Recent Trends in Empirical Research*. The World Bank Working Paper No.120, Washington D.C.,USA. https://documents1.worldbank.org/curated/en/411271468328170114/pdf/405430Communic18082137167101PUBLIC1.pdf

Iwan, I. P., Putra, P., & Astama, I. K. (2022). The Study of Added Value Analysis of Coffee Processing in Indonesia. *Agribisnis Journal*, *5*(2). https://doi.org/http://dx.doi.org/10.31327/aj.v5i2.1839

Kanchewa, M., Rodriguez, M. T., Buck, E., Niewoehner, J., & Lamm, A. J. (2020). Impact of Agricultural Communication Interventions on Improving Agricultural Productivity in Malawi. *Journal of International Agricultural and Extension Education*, *27*(3), 116–131. https://doi.org/https://doi.org/10.5191/jiaee.2020.273116

Kurniawan, R. (2023). *Pembangunan berkelanjutan dalam perspektif pembangunan lingkungan*. Sekretariat Nasional SDGs, Laporan Manajer Pilar pembangunan, kementrian PPN/Bappenas.

Lee, D. (2000). The Society of Society : The Grand Finale of Niklas Luhmann. *JSTOR Journal Storage*, *18*(July), 320–330. https://www.jstor.org/stable/223319

Leeuwis, C., & Ban, A. Van Den. (2004). *Communication for Rural Innovation: Rethinking Agricultural Extension* (Issue April). https://doi.org/10.1002/9780470995235

Loghmani-khouzani, T., Dany, V., Seifert, N., & Madani, K. (2024). Can citizen science in water-related nature-based solutions deliver transformative participation in agri-food systems ? A review. *Agricultural Systems*, *220*(June), 104052. https://doi.org/10.1016/j.agsy.2024.104052

Luhmann, N. (1992). What is Com m u n icat ion ? *Communication Theory*, *2*(3), 251–259. https://doi.org/https://doi.org/10.1111/j.1468-2885.1992.tb00042.x

Mahdi, D. A. M. A. (2022). *indonesian coffee at the international market.pdf*. 261–272. https://doi.org/https://doi.org/10.22437/jpe.v17i2.13983.

Mefalopulos, P. (2008). *Development Communication Sourcebook. Broadening the Boundaries of Communication*. The International Bank for Reconstruction and Development/The World Bank. https://documents1.worldbank.org/curated/en/752011468314090450/pdf/446360Dev0Comm1ns0handbook01PUBLIC1.pdf

Michael, P. T., & Smith, S. C. (2012). *Economic Development, 11th Edition* (13th ed.). Person Education. https://archive.org/details/economicdevelopm11edtoda/page/n1/mode/2up

Mody, B., & Gudykunst, W. B. (2002). *Handbook of International and Intercultural Communication* (2nd ed.). SAGE Publications Thousand Oaks California.

Neisig, M. (2017). Transition in Complex Polycentric Contexts : Trusting and Multifunctional Semantics. *Systems Research and Behavioral Science*, *34*(2), 163–181. https://doi.org/10.1002/sres.2450

Nora Cruz Quebral. (2012). *Development Communiation Primer*. Southbound Sdn. Bhd. Penang Malaysia. https://www.southbound.com.my/downloads/QuebralCruzPrimer2012.pdf

Rampold, S. D., Lamm, A. J., & Mckee, B. (2020). Exploring Consumer Financial Support to Inform Communication about Agricultural Best Management Practices. *Journal of Agricultural Education*, *61*(1), 60–73. https://doi.org/https://doi.org/10.5032/jae.2020.01060

Rogers, E. M. (2003). *Diffusion of Innovations 5th Edition*. Free Press of Glencoe. https://archive.org/details/diffusionofinnov00roge_0/page/n1/mode/2up

Singer, N. R., & Kristiansen, S. (2023). Communicating Transformation in Food and Agricultural Ecologies Communicating Transformation in Food and Agricultural. *Environmental Communication Journal*, *17*(8), 861–867. https://doi.org/10.1080/17524032.2023.2281651

Staden, W. Van, Sisitka, L., & Lingen, S. Van. (2022). Sustainable agricultural online course development framework for community-based transformative learning. *South African Journal of Agricultural Extension*, *50*(1), 40–59. https://www.ajol.info/index.php/sajae/article/view/254845

Teketay, D. (1999). Coffee Growing Regions in Ethiopia. *Ethiopian Wildlife and Natural History Society*, *1*(20), 28–50. https://journals.co.za/doi/epdf/10.10520/AJA00837059_213

Tucker, C. M. (2017). *Coffee Culture: Local Experiences Global Connections, The Routledge Series for Creative Teaching and Learning in Anthropology* (R. H. Robbins & L. A. Vivanco (eds.); 2nd editio). Routledge Publisher, Taylor & Francis Group, New York, USA. http://cw.routledge.com/textbooks/anthropologyofstuff/

Viana, V., Lorrane, L., Borges, R., Ribeiro, T., Henrique, M., & Cesar, P. (2024). Trends in Food Science & Technology Coffee : A comprehensive overview of origin , market , and the quality process. *Trends in Food and Science and Technology*, *146*(October 2023), 1–18. https://doi.org/10.1016/j.tifs.2024.104411