ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 01, January, 2024

Insights of Social-ecological Resilience between Organic Farmers and Extension Agents in Chiang Mai Province, Thailand

Chaiteera Panpakdee[1]

Department of Agricultural Extension and Development, Faculty of Agriculture, Khon Kaen University, Khon Kaen, 40002, Thailand[1]

ABSTRACT— The objective of this study was to gauge insights of the social-ecological resilience of extension agents to compare with organic farmers' primitive scores. Forty-seven social-ecological components for building resilience in organic rice production were used to interview randomly selected 29 extension agents. They were strategically asked to assign a score to each vital property of resilience and estimate how this property's relative intensity. The scoring values were calculated using normalization to assign the properties' relative intensities available on a common scale. Next, one sample t-test at the level of significance of 0.05 was carried out to compare the two parties' relative intensities. The results revealed that three out of the four vital properties of resilience were not significantly different. The difference was only found in the vital property of 'Learning to live with change and uncertainty' due to organic farmers' unaltered hindrances, such as they were elders and mediocre educated. To solve these, organic farmers must exploit utilities from Information and Communication Technology (ICT) as its benefit is enormous for improving decision-making and increasing market competition. This should be together done with allowing organic farmers to design their learning schemes, with the assistance of extension agents to ensure active collaboration and knowledge exchange.

KEYWORDS: Social-ecological resilience, resilience, agricultural extension, extension agent, organic rice

1. INTRODUCTION

Resilience has been lauded as a potent solution for managing various types of change, given its capacity to absorb disturbances and recover with the same identity across different temporal and spatial scales [14]. These attributes make it suitable for agriculture, which is an open system characterized by dynamic transitions within embedded subsystems [6]. For instance, at the farm level, decisions regarding crop selection and timing are shaped not only by biological factors such as climate, soils, and topography but also by cultural systems that encompass norms, preferences, and traditions, influencing farmers' assessments of opportunities [11].

Achieving resilience requires a well-designed plan and a farming system that enables day-to-day management based on local resources. Organic farming, for example, has proven effective in this regard [19]. Its emphasis on biodiversity allows farmers to produce quality yields while utilizing natural resources more efficiently [29]. However, the complexity of organic farming necessitates a strong understanding of farm management, encouraging farmers to develop adaptive capacities to adjust practices and objectives quickly. To harness these benefits, organic farmers need support in the form of tax incentives and knowledge aligned with agroecological systems [22]. Given the complexity of agriculture, which is interconnected with economic, social, and environmental aspects, relying solely on farmers' abilities is insufficient to address adversities across these dimensions. Therefore, external guidance, particularly from extension agents, is necessary. They

play a vital role in building resilience by providing approved frameworks to support organic farmers by sending knowledge and decision-making systems to boost organic farmers' abilities [23]. Collaboration between organic farmers and extension agents is crucial in developing workable outcomes [31].

However, historical agricultural development has often witnessed a lack of understanding between these two parties [3]. This has been exemplified during the COVID-19 pandemic, where organic farmers struggled to respond to the crisis, leading to productivity losses [2]. Extension agents adopted unconventional approaches such as video conferences to deliver advisory services, but many organic farmers, especially those in rural areas, were unprepared to embrace this technology [8]. Similarly, extension agents faced challenges in using digital tools due to their unfamiliarity with complex functions. Consequently, organic farmers faced a lack of information coupled with poverty, further exacerbating the impact of the pandemic [6].

Researchers have identified two key factors of such outcomes. First, agricultural development strategies have prioritized establishing rigid frameworks to achieve short-term productivity goals, while neglecting the strengthening of farmers' adaptive capacities. Second, the misalignment of insights between farmers and extension agents has often been cited as a primary reason for failure in agricultural development [7]. Both organic farmers and extension agents are crucial stakeholders in agriculture. Organic farmers are key actors in food production, accounting for over 80 percent of the world's food output, while extension agents play a pivotal role in guiding organic farmers towards more sustainable practices. However, there is a lack of awareness regarding conditions and perspectives between these two groups. This lack of connectedness hampers opportunities for building resilience. This lack of connectedness is particularly detrimental in organic agriculture, which is fragile and reliant on chemical-free practices. In turbulent contexts, the guidance provided by extension agents becomes imperative [14].

Conceptually, the objective of this study is to compare the social-ecological resilience insights of organic farmers and extension agents. This exploration aims to foster a better understanding between these two groups and yield outcomes that can inform future policies aimed at building resilience in organic rice production.

2. MATERIALS AND METHODS

This study draws upon existing literature that study the connections between organic farmers and extension agents in building resilience in Thailand. There is a scarcity of related literature on this topic. To contribute empirical information, the author has laid a foundation by using the results from two previous studies [26], [27].

The first study explores the use of knowledge and perspectives among fifty-three organic farmers in four districts of Chiang Mai: Mae Rim, San Sai, Mae Taeng, and Phrao. The aim was to identify resilience components that align with the specific contexts of these districts. As a result, forty-seven social-ecological resilience components were identified and categorized into four vital properties of resilience: (1) 'Learning how to live with change and uncertainty'; (2) 'Nurturing diversity in its various forms'; (3) 'Combining different types of knowledge and learning'; and (4) 'Creating opportunities for self-organization and cross-scale linkages' [26]. The second study extends the findings of the first study. The fifty-three organic farmers were asked to assign relative intensities to the four vital properties of resilience using normalization methods [27]. The key findings from these studies are summarized in Table 1.

2.1 Sampling Procedure

To handle the complexity of the data collection, the study was divided into 2 periods: from March to April 2022 and October 2023. The recruitment process for this study occurred in two stages. First, the study's

ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 01, January, 2024

population comprised essential stakeholders involved in activities related to build resilience efforts for organic rice production. These stakeholders were identified by the District Agricultural Offices (DAOs), which provided detailed information and screening, resulting in a total of 32 qualified informants [12]. Second, considering a 5% margin of error and the total population, Yamane's Formula was used to determine a minimum suggested sample size of 29 extension agents [35].

To be noted, participation in this study was voluntary, and all extension agents signed an informed consent form before taking part in the study.

2.2 Data Collection

The data collection method involved individual semi-structured interviews utilizing a question guide. The interviews began by gathering information on the extension agents' socioeconomic characteristics. Next, they were provided with details about the four vital properties, which were designed to explore the origins and qualities associated with building resilience of organic rice production in the specific contexts of Chiang Mai province. The objective was to familiarize them with resilience theories and enhance their understanding. Informational elaborations were provided for each component, highlighting their effectiveness in facilitating adaptations and transformations [10], [11]. This involved guiding the extension agents through a systematic thought process to compare the different components and determine their prioritization [1].

Finally, the extension agents were asked to use their cognitive awareness to assign a rating on a fundamental scale of 1 to 9, reflecting the relative intensity of each vital property. The rationales they used to support their judgments were recorded to complement the findings of the statistical analyses [11].

2.3 Data Analysis

The analysis of relative intensities was conducted individually for each extension agent. The scores assigned to each vital property by them were summed, and then divided by the number of participants (n=29) to calculate the average for that specific property [4]. The next step involved normalization. It was done by dividing the mean by the sum of the other mean values paired with the remaining vital properties. This process ensured that each vital property's relative intensity was measured on a ratio scale, with a total summation equal to 1. This entire process was repeated for all four vital properties to ensure consistency and enable comparison across different datasets [20].

Next, a one-sample t-test was conducted at a significant level of 0.05 [1]. This analysis aimed to determine whether there were heterogeneous mean differences between the datasets of the fifty-three organic farmers and the twenty-nine extension agents regarding their contributions to building resilience. The analysis was done for each vital property, starting from the vital property 'Learning to live with change and uncertainty' and progressing through to 'Creating opportunities for self-organization and cross-scale linkages.'

Table 1: A list of social-ecological resilience components for building resilience in organic rice production

Vital property	Components	The basis of consideration
Learning to live with change and uncertainty **(0.25)**	1. Educational level	▪ Degree of educational accomplishment
	2. Rice farming experience	▪ Number of active years in both organic and conventional rice production
	3. Occupational skills	▪ Number and degree of skills to accomplish the on-farm tasks
	4. Gender equality	▪ Degree of women in educational equality and involvement in decision making
	5. Investment in farm assets	▪ Number of investments in farm equipment and kinds of risk management

	6.	Investment in basic farm equipment	▪ Number of basic farm equipment
	7.	Utilization of ecological services	▪ Number and degree of benefits gained from ecological services
	8.	Additional exploitation from existing water resources	▪ Number of strategies used to exploit greater benefits from existing water resources
	9.	Inquisitive mind for lifelong learning	▪ Degree of collective action, trust, and solidarity in society, number of accessible social network participation and types of media (newspaper, TV, radio, ICTs), number of household members involved in farming and/or social networks
	10.	Organically oriented mindset	▪ Switch to organic rice production must be driven by either health or environmental concerns, not economic income
	11.	Land tenure	▪ Percentage of land use holding
Nurturing diversity for reorganization and renewal **(0.23)**	12.	Diversity of plant species	▪ Number and variety of planted crops
	13.	Diversity of rice varieties for production	▪ Number of planted rice varieties
	14.	Diversity of income sources	▪ Number of income sources considering both on and off-farm
	15.	Diversity of marketing channels	▪ Number and type of accessible markets, and the distance between the farm and key markets within the province
	16.	Ownership of guaranteed price and organic certification	▪ Ownership of guaranteed price and organic certification
	17.	Given an honorific address	▪ Number and type of honorific address given by institutions
	18.	Diversity of water resources	▪ Number and degree of usable water resources
	19.	Diversity of credit sources	▪ Number of accessibly legal credit sources, and amount of debt independence from those legal credit sources
	20.	Diversity of information sources	▪ Number and degree of accessible information sources
	21.	Diversity of collaborative networks	▪ Number, type, and degree of collaborative networks

Vital property		Components	The basis of consideration
Combining different types of knowledge for learning **(0.26)**	22.	Knowledge designed by a bottom-up approach	▪ Number and degree of appropriate courses designed locally
	23.	Heritage of indigenous knowledge	▪ Degree in documenting and transmission of indigenous knowledge
	24.	Existence of dialect and local traditions	▪ Degree of speaking the local dialect to others, and degree of maintaining local traditions
	25.	A variety of learning approaches	▪ Number and degree of educational platforms for learning
	26.	Obtaining knowledge through the second agricultural employment	▪ Ownership of the second agricultural employment, and the number of benefits gained from that employment
	27.	Effective use of ICT	▪ Degree of accessible ICT, and number of benefits gained from ICT
	28.	Adaptation	▪ Number of introduced adaptations into the farm, and degree of shocks and stresses solved by the adaptations
	29.	Value-added products	▪ Number of processed rice products
	30.	Organizing financial flows with the household account	▪ Degree of recording household account/number of using the household account's data for significant decision making
	31.	Reasonable farm scale	▪ The effective ratio between land used and the amount of household labor

ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 01, January, 2024

	32.	Securing consumer confidence	▪ Number of strategies conducted for building loyal consumers
	33.	Being a full-time farmer	▪ Having off-farm employment or not
	34.	Marital status and independence of children	▪ Having a spouse to support farm activities or not, and having children who cannot take care of themselves in the household or not
	35.	Number of farming generations	▪ Number of household ancestors who produced rice
	36.	Number of neighboring organic farmers	▪ Number of organic farmers in the community, and number of local farmers who can teach know-how and techniques
Creating opportunity for self-organization and cross-scale linkages **(0.26)**	37.	Dependence on household resources	▪ Number of household resources used to nourish the farm
	38.	Self-rice seed production	▪ Dependence on self-rice seed production or not
	39.	Dependence on rice and dietary materials self-produced	▪ Degree of self-production of rice and dietary materials consumed within the household
	40.	Dependence on household labor	▪ Percentage of household labor used in the farm activities
	41.	Rice field location	▪ Degree of exposure caused by nearby chemical rice fields and non-agricultural sectors
	42.	Co-operative farming	▪ Type of assistance obtained from collaborating with networks
	43.	Knowledge exchange through networks	▪ Number of accessible networks for knowledge exchange/degree of knowledge learned efficiently through the networks, number of methods used for knowledge exchange
	44.	Dependence on locally productive inputs	▪ Degree of using productive inputs either sold or produced at the local
	45.	Dependence on local food systems	▪ Degree of locally sourced food consumed within the household
	46.	Mutual labor exchange	▪ Degree of using mutual labor exchange to produce organic rice
	47.	Favorable support from the governments	▪ Degree of satisfaction with the central and local governments' supports in required aspects of producing organic rice

Note Bold numbers in parentheses are the important intensity of each vital property.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic Characteristics of Extension Agents

In Table 2, a summary of the extension agents' socioeconomic data is provided, revealing that the majority (62.07%) of them were female. This finding aligns with the report from the Office of the Civil Service Commission, which stated that women constituted most public servants in the Ministry of Agriculture and Cooperatives of Thailand [25]. The summary also indicates that the highest educational achievement for most extension agents (65.51%) was a master's degree. This finding is significant, as a study has indicated that holding a master's degree is a minimal requirement to become a senior government officer in Thailand [13].

Table 2: Socioeconomic characteristics of extension agents (n = 29)

Characteristics	Categories	Frequency (no.)	% of extension agents
Genders	Male	11	37.93
	Female	18	62.07
Age (years)	29-38	13	44.83
	39-48	10	34.48
	Above 49	6	20.69

Educational Accomplishments	Bachelor's degree	8	27.59
	Master's degree	19	65.51
	Doctor of Philosophy	2	6.90
Years of experience in administrating actions and policies	6-10	5	17.24
	11-15	17	58.62
	16 and above	7	24.14

3.2 Vital Property Scores of Extension Agents compared to Organic Farmers

Table 3 presents the comparative scores of the vital properties between the two parties, along with the results obtained from the one-sample t-test.

The scores exhibited notable differences due to the extension agents' perspectives. These findings indicate that the establishment of resilience in organic rice production, in response to disturbances, heavily relies on 'Nurturing diversity for re-organization and renewal' and 'Creating opportunities for self-organization and cross-scale linkages.' This is supported by the respective scores of 0.24 and 0.27, which were higher than the organic farmers' scores. Conversely, the average score for 'Learning to live with change and uncertainty' was lower compared to the organic farmers. Statistically, the results show that three out of the four vital properties did not exhibit significant differences between the two parties. The notable difference was only seen in 'Learning to live with change and uncertainty.'

Table 3: Results computed by one simple t-test (n = 29)

Vital Properties	**Means of organic farmers**	**Means of extension agents**	***t***	**df**	**Sig. (2-tailed)**
Learning to live with change and uncertainty	0.23	0.22	3.52	28	0.01
Nurturing diversity for re-organization and renewal	0.24	0.25	2.84	28	0.17
Combining different types of knowledge for learning	0.27	0.26	0.07	28	0.73
Creating opportunities for self-organization and cross-scale linkages	0.26	0.27	0.31	28	0.71

Note The level of significance was 0.05.

3.2.1 Significance of "Learning to live with change and uncertainty"

This fundamental property stands as a crucial characteristic of resilient systems, playing a pivotal role in facilitating astute adaptations, particularly during phases of reorganization and renewal [11]. A nuanced examination of the comparative data from the two cohorts revealed significant disparities, underscored by a p-value of 0.01 (see Table 3).

Extension agents astutely acknowledge the paramount significance of this essential factor in resilience-building. However, triumph in this realm hinges on multifaceted considerations, some of which may transcend the capacities of organic farmers. An exemplification of such a factor is the 'Inquisitive Mind for Lifelong Learning' (refer to Table 1), which accentuates the continuous pursuit of personal development and has garnered recognition for its efficacy in adapting to unforeseen changes [34].

According to insights gleaned from extension agents, establishing self-directed education necessitates early exposure to both formal and informal training. Given the socioeconomic constraints faced by organic farmers, surmounting this obstacle may appear idealistic. The agricultural landscape in Chiang Mai, akin to other provinces in Thailand, heavily relies on the stewardship of older individuals for organic rice production. These

ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 01, January, 2024

stalwarts not only grapple with physical vulnerabilities but also contend with economic challenges, exacerbated by the niche market for domestic organic rice, bereft of an official premium pricing structure. Consequently, organic farmers confront impediments in pursuing dynamic learning pathways. The inadequacy of income often compels them to seek supplemental off-farm employment opportunities [21]. Consequently, the division of time between on-farm and off-farm responsibilities diminishes their prospects of attaining this pivotal component. The exigencies of multitasking during the limited time dampen individuals' enthusiasm for acquiring novel knowledge and skills [18].

3.2.2 Significance of 'Nurturing diversity for re-organization and renewal'

This pivotal property underscores the strategic importance of integrating diverse elements into organic rice production, offering alternative pathways for crisis mitigation. The concept of diversity, as expounded by [14], [15], transcends mere numerical abundance, encapsulating three interconnected and distinct conditions: (1) Variety (presence of different elements); (2) Balance (distribution of each element); and (3) Disparity (differences among the elements).

From a statistical standpoint, the findings reveal shared perspectives between both cohorts, as evidenced by a p-value of 0.17 (see Table 3). According to extension agents, most components germane to this vital property are not only deemed essential but are also deemed feasible for implementation. Take, for instance, the component 'Diversity of Water Sources' highlighted in Table 1, recognized as pivotal for the success of all agricultural systems, particularly in the realm of organic farming. Adequate water serves a multifaceted role, contributing to oxygen and biochemical substance dissolution, weed and pest control, and achieving sufficient organic rice yields [17]. Moreover, the presence of accessible water sources mitigates conflicts among community members related to water distribution, a recurrent issue in Thailand. Discord within a community impedes essential social factors vital for resilience-building, such as data and information exchange [16].

Extension agents posit that establishing water sources has become increasingly feasible for organic farmers compared to the past, owing to the willingness of numerous domestic organizations to helps. A case in point is the Department of Land Development, which has spearheaded initiatives to install agricultural ponds and wells for farmers upon request [19]. This attests to the practicality of fortifying resilience through the adoption of diverse water sources.

The significance of the 'Diversity of Rice Varieties' component was underscored, affirming the importance of diversification to forestall farm specialization, a phenomenon that could precipitate a decline in biodiversity. Extension agents emphasize that during crises, possessing an array of rice varieties ensures food security and provides an alternative avenue for transformation by mitigating the impact of market demand fluctuations [30]. Comparable advantages accrue to the 'Diversity of Plant Species' component, which assumes even greater significance. When the diversification of plant varieties is methodically designed to align with available land size and household labor, it engenders resilient farming practices. The presence of diverse plants empowers organic farmers to engage in multiple agricultural activities. This versatility proves invaluable, particularly in the face of diverse disturbances in organic rice production, where a holistic understanding of farm management becomes imperative [34].

3.2.3 Significance of 'Combining different types of knowledge for learning'

This crucial property underscores the amalgamation of diverse knowledge forms, encompassing formal insights from academic literature and indigenous wisdom [15]. Every facet of knowledge plays a pivotal role in fostering awareness and addressing shifts within agro-ecological systems [11].

From a statistical vantage point, the results reveal a harmonious alignment in perspectives between the two groups concerning this property, as evidenced by a p-value of 0.73 (see Table 3). This convergence suggests that all components associated with this vital property are not only imperative but also practically viable within the specific contexts of Chiang Mai Province.

Extension agents underscore the imperative of infusing accountability into organic rice production, particularly concerning the shift from subsistence farming to agribusiness. This underscores the pivotal role of proficient management for optimizing satisfactory profits. However, attaining this objective becomes intricate when specific types of indigenous and scientific knowledge are insufficient for informed decision-making [9]. An illustrative example pertains to organic farmers possessing fundamental knowledge of soil tillage, a critical method for upholding soil fertility and curbing weed proliferation [28]. It is crucial to recognize that soil tillage, despite its apparent simplicity, demands nuanced consideration. Drawing from the experiences of most extension agents, improper soil tillage practices, such as inadequate attention to tillage timing, can precipitate soil erosion issues. Furthermore, the integration of local knowledge stands out as a potent enhancer of soil tillage outcomes. For instance, practices like constructing rice terraces in tilled lands, especially in semi-lowlands and uplands, and incorporating crop rotation (involving organic rice, maize, and black beans) exemplify how indigenous wisdom can seamlessly complement modern practices [33]. This not only begets appropriate farming methodologies but also contributes to the incremental development of resilience. By augmenting adaptive capacity to navigate evolving agricultural conditions, farmers can effectively respond to challenges [22].

3.2.4 Significance of 'Creating opportunities for self-organization and cross-scale linkages'

This vital property is dedicated to orchestrating networks across diverse hierarchical levels. Organic farmers, armed with network access, stand poised to enhance resilience, leveraging social connections for support during crises. In certain instances, these individuals wield the potential to elevate local organic farming cohorts into influential agribusiness entities, conferring bargaining power as both yield sellers and input buyers [14]. As elucidated in Table 3, a computed p-value of 0.71 underscores a shared perception of this property between the involved parties.

Extension agents accentuate the foundational role of self-dependence in resilient systems when elucidating the facets of this property. Thus, it becomes imperative for organic farmers to instill components such as 'Dependence on household resources' and 'Self-rice seed production.' Access to essential resources, such as labor and rice seeds within the confines of their households, empowers organic farmers to rely on their own reservoirs, promptly mitigating risks sans external assistance [24]. This self-reliance not only begets autonomy and alternatives but also facilitates agile and efficacious responses to uncertainties [8]. Consequently, the resilience of organic farmers is not merely established but sustained over time, liberating them from undue dependence on sporadic external interventions [22].

It is paramount to acknowledge that while hinging on household resources assumes a pivotal role in resilience-building, external support mechanisms such as policies and networks spanning different echelons are indispensable [36]. The amalgamation of self-dependence and external systems is thus imperative, particularly when organic rice production is situated within broader sectors [7].

In contrast to national and higher tiers, local-level organizations assume heightened importance due to their inherent advantages in delivering aid to surmount adversities. To expound upon this assertion, the instance of 'Co-operative farming' is deliberately invoked. An extension agent in the Phrao District illuminates how a local organic rice collective, alongside analogous groups, pooled resources to acquire essential equipment,

exemplified by a rice milling machine [32]. This collective decision not only curtailed transaction costs but also furnished exclusive organic tools distinct from conventional farming practices [5]. The illustration underscores the pivotal role of cooperative farming in fortifying resilience through collaborative pursuit of shared objectives, achieving heightened efficiency. Moreover, the establishment of cooperative farming engenders positive outcomes in the form of solidarity, mutual support, and shared responsibility for the well-being of the cooperative and its members. These attributes, nurtured over time, become instrumental in the protracted development of resilience within local bonds [36].

4. CONCLUSIONS AND RECOMMENDATIONS

This study delves into the nuanced perspectives of social-ecological resilience concerning organic rice production, contrasting the viewpoints of organic farmers and extension agents. A specific research inquiry guided this exploration: "Is there a discernible variance in comprehension between these two stakeholder groups concerning the approach to social-ecological resilience?" The implications of the findings are of paramount importance, serving as a foundational resource to shape forthcoming policies designed to fortify resilience within the domain of organic rice production.

In terms of the research outcomes, three of the four vital properties integral to resilience—namely, 'Nurturing diversity for re-organization and renewal,' 'Combining different types of knowledge for learning,' and 'Creating opportunities for self-organization'—revealed no statistically significant differences. This convergence implies a shared understanding between extension agents and organic farmers regarding the underpinnings of social-ecological resilience in organic rice production. This unity of insight is rationalized by the indispensability of these vital properties and their components, rendering them not only universally essential but also practically implementable on organic rice farms within the specific context of Chiang Mai. However, a divergence surfaced in the first property, 'Learning to live with change and uncertainty,' illuminating disparities arising from its somewhat idealistic components that influence the formulation of adaptive responses to change.

Two discernible policy implications emanate from these findings. First, the identified challenges linked to the age range and comparatively lower educational levels of organic farmers in embracing the 'Learning to live with change and uncertainty' property can be effectively addressed through meticulously devised extension plans. Crucially, essential knowledge crucial for proficient organic rice production extends beyond the boundaries of traditional farming disciplines. The involvement of other governmental departments is warranted to facilitate the dissemination of knowledge. Particularly, the incorporation of indigenous knowledge, coupled with supportive data, stands out as a viable recommendation. The integration of indigenous knowledge, renowned for its efficacy in resonating with organic farmers due to their inherent familiarity with local information systems, can significantly augment the understanding of these vital aspects.

Second, recognizing that learning activities constitute multidimensional processes, encompassing both quantitative and qualitative facets, underscores the necessity for organic farmers to actively engage in crafting their educational initiatives. Establishing robust partnerships with extension agents is paramount and can be achieved through structured group surveys and in-person interviews. This proactive collaboration and knowledge exchange model ensure a dynamic and reciprocal learning environment, fostering a synergistic relationship between organic farmers and extension agents.

5. ACKNOWLEDGEMENT

We would like to express our gratitude to the 29 extension agents who participated in this research.

6. REFERENCES

[1] Abuhamda, E., Ismail, I. and Bsharat, T. (2021). Understanding quantitative and qualitative research methods: A theoretical perspective for young researchers. International Journal of Research. 8: 71-87. doi:10.2501/ijmr-201-5-070.

[2] Alawin, M. (2022). Trade balance and the Covid-19 pandemic: The case of Jordan. Humanities and Social Sciences Letters. 10(4): 584-592. https://doi.org/10.18488/73.v10i4.3211.

[3] Albore, A. (2018). Review on role and challenges of agricultural extension service on farm productivity in Ethiopia. International Journal of Agricultural Education and Extension. 4(1): 93-100. https://doi.org/10.47747/ijfr.v4i2.1153.

[4] Ameen, R. and Mourshed, M. (2019). Urban sustainability assessment framework development: The ranking and weighting of sustainability indicators using analytic hierarchy process. Sustainable Cities and Society. 44: 356-366. https://doi.org/10.1016/j.scs.2018.10.020.

[5] Arunrat, N. and Pumijumnong, N. (2015). Assessment of vulnerability to food security of farmers in Sisaket Province, Thailand. Journal of International Academic Research for Multidisciplinary. 1625: 2320-5083.

[6] Béné, C. (2020). Resilience of local food systems and links to food security–a review of some important concepts in the context of COVID-19 and other shocks. Food Security. 12: 1-18. https://doi.org/10.1007/s12571-020-01076-1.

[7] Blackmore, C., Sriskandarajah, N. and Ison, R. (2018). Developing learning systems for addressing uncertainty in farming, food, and environment: what has changed in recent times? International Journal of Agricultural Extension. 3: 3-14.

[8] Bukchin, S. and Kerret, D. (2020). The role of self-control, hope, and information in technology adoption by smallholder farmers—A moderation model. Journal of Rural Studies. 74: 160–168. https://doi.org/10.1016/j.jrurstud.2020.01.009.

[9] Carr, A., Balasubramanian, K., Atieno, R. and Onyango, J. (2018). Lifelong learning to empowerment: Beyond formal education. Distance Education. 39 (1): 69–86. https://doi.org/10.1080/01587919.2017.1419819.

[10] Darnhofer, I., Fairweather, J. and Moller, H. (2011). Assessing a farm's sustainability: insights from resilience thinking. International Journal of Agricultural Sustainability. 8(3): 186-198. https://doi.org/10.3763/ijas.2010.0480.

[11] Darnhofer, I., Lamine, C., Strauss, A. and Navarette, M. (2016). The resilience of family farms: towards a relational approach. Journal of Rural Studies. 44, 111-122. https://doi.org/10.1016/j.jrurstud.2016.01.013.

[12] Department of Agricultural Extension. (2023). The Staffing Framework of Department of Agricultural Extension. URL.: http://www.person.doae.go.th/person2011/node/2180.

[13] DOAE. (2021). Guidelines and operations of Department of Agricultural Extension. Accessed on

08/09/2022. (Available on: URL.: http://www.krabi.doae.go.th/1.pages/page%20menu/pages%20menu2/%E0%B9%81%E0%B8%99%E0%B8%A7%E0%B8%97%E0%B8%B2%E0%B8%87%E0%B8%81%E0%B8%B2%E0%B8%A3%E0%B8%94%E0%B8%B3%E0%B9%80%E0%B8%99%E0%B8%B4%E0%B8%87%E0%B8%B2%E0%B8%99%20%E0%B8%9B%E0%B8%B564_19%E0%B8%95%E0%B8%8463.pdf

[14] Folke, C. (2016). Resilience (Republished). Ecology and Society. 21(4): 44. doi:10.5751/ES-09088-210444.

[15] Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. Ecology and Society. 15: 1-9. DOI:10.5751/ES-03610-150420.

[16] Formoso, B. (2021). The agroecological sustainability of petty farmers in Thailand: A challenge for the future. Current Research in Environmental Sustainability. 3: 100078. https://doi.org/10.1016/j.crsust.2021.100078.

[17] Hérique, O. and Faysse, N. (2020). A large-scale public programme to promote organic rice farming in Thailand: building solid foundations to enable farmers to engage? Organic Agriculture. 11(3): 27-40. doi: 10.1007/s13165-020-00320-4.

[18] Jeong, S. H. and Hwang, Y. (2016). Media multitasking effects on cognitive vs. attitudinal outcomes: A meta-analysis. Human Communication Research. 42(4): 599-618. https://doi.org/10.1111/hcre.12089.

[19] Jiaphasuanan, T., Wanchai, P. and Salaow, S. (2022). Biodiversity of aquatic insects in Good Agricultural Practices rice fields in Lower Northeastern. Naresaun Phayao Journal. 13(3): 74-83.

[20] Jowsey, T., Deng, C. and Weller, J. (2021). General-purpose thematic analysis: a useful qualitative method for anesthesia research. BJA Education. 21(12): 472-478. doi:10.1016/j.bjae.2021.07.006.

[21] Lauer, M. (2012). Oral Traditions or situated practices? Understanding how indigenous communities respond to environmental disasters. Human Organization. 71(2): 176-187. https://doi.org/10.17730/humo.71.2.j0w0101277ww6084.

[22] Mahaarcha, W. (2019). Factors Influencing Farmers' Adaptation Strategies to Climate Change in Bophloi District, Kanchanaburi Province, Thailand. Humanities, Arts and Social Sciences Studies. 19(1): 70-86. https://doi.org/10.14456/hasss.2019.4.

[23] Mathijs, E. and Wauters, E. (2020). Making farming systems truly resilient. Euro Choices. 19(2): 72-76. https://doi.org/10.1111/1746-692X.12287.

[24] Naruepatr, J. (2017). Network of Social Capital: Lesson Learned from Groups of Small Organic farmers' Self Reliance. Silpakorn University Journal of Social Sciences, Humanities, and Arts. 17(3): 63-70, https://doi.org/10.14456/sujsha.2017.28.

[25] OCSC. (2020). The report number of the government manpower in the fiscal year of 2020. Accessed on 21/10/2022. (Available on: https://www.ocsc.go.th/sites/default/files/document/thai-gov-manpower-2563-

o_0.pdf.).

[26] Panpakdee, C. and Limnirankul, B. (2018). Indicators for assessing social-ecological resilience: a case study of organic rice production in northern Thailand. Kasetsart Journal of Social Sciences. 39: 414-421. doi: 10.1016/j.kjss.2017.07.003.

[27] Panpakdee, C., Limnirankul, B. and Kramol, P. (2021). Assessing the social-ecological resilience of organic farmers in Chiang Mai Province, Thailand. Forest and Society. 5(2): 631-649. https://orcid.org/0000-0001-8075-3501.

[28] Panpluem, N., Mustafa, A., Huang, X., Wang, S. and Yin, C. (2019). Measuring the technical efficiency of certified organic rice producing farms in Yasothon Province: Northeast Thailand. Sustainability. 11: 6974. https://doi.org/10.3390/su11246974.

[29] Pardos, M., del Río, M., Pretzsch, H., Jactel, H., Bielak, K., Bravo, F. and Brazaitis, G. (2021). The greater resilience of mixed forests to drought mainly depends on their composition: Analysis along a climate gradient across Europe. Forest Ecology and Management. 481: 118687. https://doi.org/10.1016/j.foreco.2020.118687.

[30] Phungpracha, E., Kansuntisukmongkon, K. and Panya, P. (2016). Traditional ecological knowledge in Thailand: Mechanisms and contributions to food security. Kasetsart Journal of Social Sciences. 37: 82-87. https://doi.org/10.1016/j.kjss.2015.07.001.

[31] Rangsipaht, S., Saengchan, N. and Parnuwad, K. (2013). Agricultural Extension in Thailand Based on the Viewpoints of an Innovative Thinker, Prof. Rapee Sagarik. Journal of Developments in Sustainable Agriculture. 8: 41-48.

[32] Royer, A., Bijman, J. and Abebe, G.K. (2017). Cooperatives, partnerships, and the challenges of quality upgrading: A case study from Ethiopia. Journal of Co-Operative Organization and Management. 5(1): 48–55.

[33] Sarttra, T., Kittitanasak, K., Wongwaitayakul, K., Phaophu, C. and Kiatcharoenpol, T. (2023). An optimal approach for supply and demand management with the consideration of cattle herd structure management: A case study of medium-size dairy cooperative in Thailand. Computers & Industrial Engineering. 182: 109355. https://doi.org/10.1016/j.cie.2023.109355.

[34] Tittonell, P. (2020). Assessing resilience and adaptability in agroecological transitions. Agricultural Systems. 184, 102862. https://doi.org/10.1016/j.agsy.2020.102862.

[35] Yamane, T. (1967). Statistics: An Introductory Analysis. (2nd Edition). New York: Harper and Row.

[36] Yusoff, S. and Yusoff, N.H. (2021). Building Social Resilience after the 2014 Flood Disaster. Pertanika Journal of Social Science and Humanities. 29(3): 1709-1722. https://doi.org/10.47836/pjssh.29.3.13.