International Journal of Agricultural Technology 2025 Vol. 21(1):275-286
Available online http://www.ijat-aatsea.com
ISSN 2630-0192 (Online)

Factors affecting the adoption of smart root washing innovation by commercial vegetable growers in the eastern suburbs of Bangkok, Thailand

Sornphakdee, N[1]., Suwanmaneepong, S.[1*] and Llones, C.[2]

[1]School of Agricultural Technology, King Mongkut's Institute of Technology (KMITL), Bangkok, Thailand; [2]Visayas Socio-Economic Research and Data Analytics Center, Visayas State University, Baybay City, Leyte, Philippines.

Sornphakdee, N., Suwanmaneepong, S. and Llones, C. (2025). Factors affecting the adoption of smart root vegetable washing innovation of commercial vegetable growers in the Eastern suburbs of Bangkok, Thailand. International Journal of Agricultural Technology 21(1):275-286.

Abstract Result showed that 70% of the participa. nts were male, and the majority cultivated leafy vegetables. Natural canals emerged as the primary water source, with manual labour being the dominant washing method. All farmers washed vegetables manually, and 73.3% reported inadequate cleaning as their main post-harvest challenge. The adoption of the smart root washer received a moderate perceived utility score of 3.44, mirroring ratings for ease of use/complexity (mean=3.45). There was a consistent moderate perception across other adoption parameters, including observability (mean=3.44) and risk (mean=3.45). The technology's adoption trajectory encompassed knowledge, persuasion, decision-making, implementation, and confirmation stages, registering moderate acceptance levels, with scores ranging between 3.28 and 3.45. Gender was the strongest predictor across all models, with the persuasion model having the highest absolute Beta coefficient (β=0.673). The consistent significance of gender differences suggested to play a crucial role in the adoption process.

Keywords: Smart root washer, Vegetables, Innovation adoption

Introduction

With the rapid advancements in technology, innovation stands as a catalyst for shaping the trajectory of different sectors in an economy (Chinseu *et al.,* 2022; Rakshit *et al*., 2022). The innovation process is a complex, multifaceted phenomenon that emerges from rigorous research and evolves through continuous interaction with its end-users (Cavite *et al.*, 2022; Fosso and Nanfosso, 2016). Each innovation has unique attributes that can be strategically leveraged to solve problems or enhance productivity (Anwar *et al*., 2021; Cremades *et al*., 2015; Mariano *et al.,* 2012). However, the success of an innovation is not universal; it is highly dependent on many factors, including but

* **Corresponding Author:** Suwanmaneepong, S**. Email:** ksuneeporn@gmail.com

not limited to the socio-economic and cultural context in which it is introduced (National Innovation Agency, 2016).

Among the various sectors that stand to gain immensely from innovation is agriculture. Innovation in agriculture is crucial for both economic and social development (Asian Development Bank, 2022; Ebers *et al*., 2017). Modern agricultural innovations enhance sustainability and efficiency (Lorente *et al*., 2012) while improving yields and resource optimisation (Ali *et al*., 2020; Fosso and Nanfosso, 2016). These advancements not only benefit farming communities by raising living standards (Rajkhowa and Qaim, 2022) but also promote broader economic growth and reduce social disparities (Agricultural Research Development Agency, 2018). However, agricultural innovation adoption faces multiple challenges (Rakshit *et al*., 2022), including cultural barriers and financial constraints (Hasan *et al*., 2020). Adoption rates vary based on perceived benefits and cultural alignment, leading to various implications (Kelly *et al*., 2023). Thus, policy reforms and public-private collaboration are essential for improving farmers' access to these technologies (Westermann *et al*., 2018).

One innovation that holds particular potential for agriculture is the smart root washing (SRW) technology. Developed by a team at the School of Agricultural Technology as part of the Startup Innovative Business Brotherhood (SIBB) project, King Mongkut's Insititute of Technology Ladkrabnag, Thaailand. This technology addresses a specific but critical challenge faced by commercial vegetable growers—washing root vegetables. The traditional method is labour-intensive, requiring several hours to wash harvested vegetables. By automating the washing process, SRW technology not only significantly reduces labor costs and processing time but also ensures more consistent cleaning quality, making it a transformative solution for commercial vegetable producers seeking to modernize their operationsThe identification and analysis of factors that influence adoption propensity can significantly impact the successful diffusion of innovative solutions within the intended user base. Hence, the objective was to investigate the factors affecting the adoption of SRW technology among commercial vegetable growers in the eastern suburbs of Bangkok, Thailand.

Materials and methods

Data collection targeted small vegetable farmers in Bangkok's eastern suburbs (Lat Krabang, Min Buri, and Nong Chok). Surveys were distributed online through social networks and in person at the "Smart Veggies" fair at King Mongkut's Institute of Technology Ladkrabang. The prototype was demonstrated before participants completed the questionnaires(Figure 1). This methodology is allowed the gathering of data representative of small commercial growers in these areas.

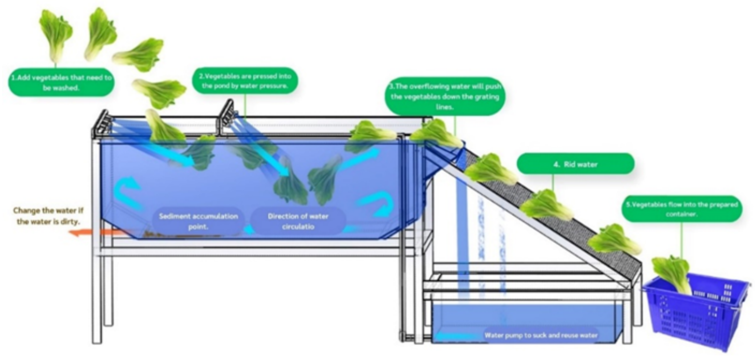

Figure 1. Photoype of smart root washer design

The study employed descriptive statistics to outline the diverse characteristics and perspectives of the sample, presented as frequency distribution tables, percentages, means, and standard deviations for comprehensive data analysis. Respondent demographics were done by providing information on the respondents including their gender, age, educational background, and experience in vegetable farming. It also covered the size of the area used for vegetable growing and the number of people involved in the activity (McHugh, 2013; Zhou *et al*., 2015). The social standing of the respondents is also considered. Acceptance of smart root washing (SRW) technology was focused on the respondents' opinions regarding the acceptance of SRW technology. The degree of acceptance is categorised into five levels based on the Likert scale (Likert, 1932) as follows: 5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1 = Strongly disagree.

The study employed a multiple regression analysis to examine the factors influencing acceptance. Rogers' diffusion of innovations theory is guided the dependent variable, which included the five stages of innovation adoption of Knowledge, Persuasion, Decision, Implementation, and Confirmation. Two groups of independent variables are used in the data analysis as farmer/farm characteristics (10 variables) and innovation characteristics (four variables) which shown in Table 1.

Table 1 The variables in multiple regression model

Variables		Description
Independence variable		
Y	Knowledge	Opinions on the adoption process of innovation in the knowledge generation stage (5 likert scale)
	Persuasion	Opinions on the adoption process of innovation in the knowledge generation stage (5 likert scale)
	Decision	Opinions on the adoption process of innovation in the knowledge generation stage (5 likert scale)
	Implementation	Opinions on the adoption process of innovation in the knowledge generation stage (5 likert scale)
	Confirmation	Opinions on the adoption process of innovation in the knowledge generation stage (5 likert scale)
Dependence variable		
X_1	Gender	Gender of the respondent 1. Male 0. Female
X_2	Age	Age of the respondent (year)
X_3	Status	Marital status of the respondent (1=Married, 0=other
X_4	Labor	Labor used in growing vegetables (1=Household labor, 0=others)
X_5	Area	Vegetable growing area (rai)
X_6	Vegetable type	Current method of washing vegetable roots (1=Using human labor, 0=others)
X_7	Farming years	Vegetable growing period for sale (year)
X_8	Water source	Water sources used for growing vegetables (1= Natural canal, 0=others)
X_9	Problem	Problems in washing vegetables (1=Not clean vegetables, 0= others)
X_{10}	Membership	Belonging to a member of a farmer group/ (1=Yes, 0=No)
X_{11}	Comparative benefits	Opinions on the acceptability of innovation characteristics in terms of comparative benefits (5 likert scale)
X_{12}	Ease of use/complexity	Opinions on the acceptability of innovation characteristics in terms of Ease of use/complexity (5 likert scale)
X_{13}	Observability	Opinions on the acceptability of innovation characteristics in terms of Observability (5 likert scale)
X_{14}	Risk perception	Opinions on the acceptability of innovation characteristics in terms of Risk perception (5 likert scale)

Results

Sociodemographic profiles of respondents

The respondents' demographic and vegetable planting profiles are detailed in Table 2. Most farmers were male (70%), aged 51-60 (40%), using family labor (90%) on small 1-5 rai plots (89.9%). They grew mainly leafy vegetables (70%), had 1-5 years farming experience (43.3%), used canal irrigation (60%), and faced challenges with manual vegetable washing (73.3%).

Table 2. Sociodemographic and vegetable farming profile

Sociodemographic profile	Frequency	%
Gender		
Male	21	70.0
Female	9	30.0
Age (year)		
30-41	5	16.6
41-50	11	36.6
More than 50	14	46.6
Status		
Single	8	26.7
Married	19	63.3
Separated	3	10.0
Labor type		
Household labor	27	90.0
Hired labor	3	10.0
Planting area		
1-5 rai	27	89.9
6-10 rai	3	10
Land characteristics		
Own land	30	100.0
Type of vegetables grown		
Leafy vegetable	21	70.0
Other (ex.Flowering vegetables)	9	30.0
Farming years		
1-5	13	43.3
6-10	17	57.7
Water source used for growing vegetables		
Natural canal	18	60.0
Other (Irrigation canal, Artesian well)	12	40.0
Washing type		
Manual	30	100.0
Problems in washing vegetables before selling		
Not clean	22	73.3
Take a long time	8	26.7

Perceived acceptance of the smart root washer

Feedback was sought from participants on their acceptance of the state-of-the-art automated root vegetable washer (SRW). User acceptance of the automated root vegetable washer was evaluated, with 80% of participants rating the machine as being of high quality and innovative. Users generally viewed it favourably (mean=3.45, SD=0.651). The highest-rated benefits were improved workplace comfort (mean=3.77, SD=0.430) and better management (mean=3.73, SD=0.450). Participants also found it well-suited to their vegetable cultivation needs (mean=3.60, SD=0.498). The SRW received positive feedback from participants, particularly for eliminating manual labour scheduling and ensuring clean vegetable washing (mean=3.47, SD=0.507). While participants valued its innovative features, they noted two key considerations: the substantial initial investment required (mean=3.45, SD=0.809) and safety concerns during operation (mean=3.40, SD=0.498). Despite these factors, the overall assessment was favourable.

Table 3. Farmers' perceived acceptance of the smart-root washer

Items	Mean	SD.	Interpretation
Comparative benefits	*3.45*	*.651*	*Agree*
Innovation is beneficial to management.	3.73	.450	Agree
Minimize root veggie washing damage.	3.13	.346	Neutral
Be comfortable working.	3.77	.430	Agree
Washed vegetables are cleaner.	3.30	.466	Neutral
Quick root veggie washing.	3.33	.479	Neutral
Saves labor in veggie washing.	3.43	.504	Agree
Ease of use/complexity	*3.45*	*.714*	*Agree*
Innovation fits your needs.	3.47	.507	Agree
User-friendly innovation.	3.40	.498	Agree
Ideal innovation for your garden.	3.60	.498	Agree
Eager to try innovations.	3.33	.479	Neutral
Observability	*3.44*	*.679*	*Agree*
Automated root washer available 24/7.	3.33	.479	Neutral
Labor-free automated root washer.	3.43	.504	Agree
Multi-tasking automated root washer.	3.53	.507	Agree
Clean veggies ready for instant delivery	3.47	.507	Agree
Risk perception	*3.45*	*.809*	*Agree*
High upfront investment required.	3.43	.568	Agree
Learn to operate root washer.	3.50	.571	Agree
Operate machine safely	3.40	.498	Agree

Perception of the use and acceptance of the innovation (SRW) characteristics

The study revealed a positive reception for SRW innovation in agriculture, with an overall average score of 3.44 across dimensions (Table 4). "Ease of Use/Complexity" ranked highest (3.45), while other dimensions like "Comparative Benefits," "Observability," and "Risk Perception" scored similarly. Throughout the acceptance process, participants exhibited a strong belief in the innovation benefits (3.73) during knowledge creation. Peer influence and proficiency in implementation were h scored 3.47, indicating their significance. The confirmation stage demonstrated a high willingness for future collaboration with innovators (3.63). These results highlighted that successful agricultural innovation adoption depending on a user-friendly design, peer recommendations, proper implementation skills, and ongoing partnerships.

Table 4. The perceived acceptance of the smart root washer

Item	Mean	SD.	Adoption level
Knowledge	*3.45*	*.765*	*High*
. Innovation is beneficial for agricultural businesses.	3.60	.498	High
. Agricultural innovations are shared across social media, websites, TV and print,	3.20	0484	Moderate
. Describe farming innovations and their advantages.	3.57	.504	High
Persuasion	*3.35*	*.740*	*Moderate*
. Share details when adopting farming innovations.	3.27	.583	Moderate
. Your community shapes farming innovation choices.	3.43	.504	High
. Learn from farmers who've tried the innovations.	3.37	.490	Moderate
Decision	*3.27*	*.913*	*Moderate*
. Choose innovations that boost your farm's value.	3.20	.551	Moderate
Adopt farming innovations that are trending now.	3.27	.583	Moderate
Consider group feedback when choosing farm innovations.	3.37	.556	Moderate
Implementation	***3.29***	***.860***	***Moderate***
Leaders influence adoption of innovations.	3.20	.484	Moderate
Team members should understand suitable innovations	3.20	.484	Moderate
Master innovations before implementing them.	3.47	.507	High
Confirmation	*3.3*	*.923*	*Moderate*
Embrace innovations to grow your farm.	3.00	.643	Moderate
Promote farming innovations to others.	3.27	.450	Moderate
Continue partnerships with farming innovators.	3.63	.490	High

Factors affecting (SRW) adoption

The regression coefficients of various factors was potentially affected the perceived acceptance of the smart root vegetable washer across different stages, namely knowledge, persuasion, decision, implementation, and confirmation (Table 5). The knowledge model was approximately 76.7% of the variance (R-square=0.767). Notably, the most influential variable was the water source problem with a Beta coefficient of -0.517, statistically significant at the 0.01 level. Whereas under persuasion, the model accounted for about 69.5% of the variance (R-square=0.695). Gender (Beta=0.673) and benefit (Beta=0.479) both had positively influenced and were statistically significant at the 0.01 level. In contrast, farming years (Beta=-0.487) had a negative impact and was statistically significant at the 0.01 level.

On the other hand, the decision model had an R-square value of 0.571. The risk was a significant positive predictor with a Beta coefficient of 0.462, significant at the 0.01 level. The water source problem also had a negative Beta of -0.469, significant at the 0.01 level. The implementation model revealed 47.9% of the variance (R-square=0.479). Vegetable type (Beta=0.471) and risk (Beta=0.485) were positively associated and statistically significant at the 0.05 and 0.01 levels, respectively. Membership displayed a significant negative association with a Beta coefficient of -0.559, significant at the 0.01 level. The confirmation model accounted for roughly 59.7% of the variance (R-square=0.597). The benefit variable had a significant favourable influence (Beta=0.5) at the 0.01 level.

Comparing the absolute Beta coefficients across all models, gender was emerged as the strongest predictor with the highest absolute Beta coefficient (β=0.673) in the persuasion model. This was followed by the membership (β=-0.559) and water source problem (β=-0.517). The consistent significance of gender difference suggested to play a crucial role in the adoption process.

Table 5. Factors affecting perceived acceptance of the smart root washer

Var.	Knowledge		Persuasion		Decision		Implementation		Confirmation	
	β Std	t-test	β Std	t-test	β Std	t-test	β Std	t-test	β Std	t-test
X_1	0.19	1.06	0.67[c]	3.23[c]	0.40	1.64	0.03	0.11	0.58[b]	2.43[b]
X_2	-0.15	-0.73	0.10	0.45	-0.02	-0.06	0.03	0.01	0.14	0.54
X_3	0.28	1.37	-0.40a	-1.87[a]	-0.01	-0.04	0.27	0.95	-0.19	-0.76
X_4	-0.05	-0.33	-0.21	-1.15	0.29	1.31	0.09	0.38	-0.17	-0.80
X_5	-0.05	-0.33	0.09	0.50	0.01	0.04	-0.07	-0.30	0.08	0.40
X_6	-0.29	-1.67	-0.34	-1.69	-0.27	-1.15	0.47[a]	1.80[a]	-0.42[a]	-1.84[a]
X_7	-0.15	-0.76	-0.49[b]	-2.21[b]	0.18	0.71	0.35	1.21	-0.20	-0.78
X_8	-0.52[c]	-3.26[c]	-0.33	-1.80	-0.47[b]	-2.18[b]	0.02	0.09	-0.28	-1.14
X_9	-0.11	-0.59	0.36	1.76	-0.19	-0.78	-0.56[b]	-2.10[b]	-0.12	-0.53
X_{10}	-0.03	-0.21	-0.22	-1.17	-0.17	-0.75	-0.23	-0.94	-0.3	-1.39
X_{11}	0.23	1.46	0.48[b]	2.63[b]	0.08	0.37	0.23	0.99	0.50[b]	2.39[b]
X_{12}	-0.22	-1.13	0.15	0.67	-0.09	-0.33	-0.21	-0.74	-0.18	-0.71
X_{13}	0.50	2.98[c]	-0.19	-0.99	-0.02	-0.10	-0.46[a]	-1.85[a]	0.11	0.49
X_{14}	0.45	3.12[c]	0.39	2.37	0.46[b]	2.38[b]	0.49[b]	2.27[b]	0.18	0.93
DF		14		14		14		14		14
F-test		3.53		2.44		1.43		0.98		1.59
p-value		0.01		0.05		0.25		0.51		0.19
R-square		0.767		0.70		0.57		0.48		0.60
Adj R-square		0.55		0.41		0.17		-0.01		0.22

Significance level: [a] 0.10; [b] 0.05; [c] 0.01

Discussion

This study investigated the receptivity of commercial vegetable growers in Bangkok's eastern suburbs towards smart vegetable root cleaning technology. The findings suggested a strong inclination among these growers towards embracing innovative solutions that address their agricultural challenges. It emerged that a significant 80% of the sample group positively viewed the automated root vegetable washer, citing its inherent advantages. However, 20% of the participants expressed reservations. The overarching sentiment arising from the study emphasised the need for bolstering awareness and education about such innovations. Enhanced understanding would facilitate smoother adoption, ensuring the utilisation of the technology to its maximum potential, echoing the sentiments of Gonzalvo *et al*. (2020).

Furthermore, the study findings resonated with those of Oo (2020), highlighting that users' perceptions is significantly influenced their willingness to adopt new technologies. Grasping an innovation's true essence and purpose can lead users to derive more value from it, reaffirming the observations of Lee and Trimi (2018). Specifically, the commercial vegetable farmers in this study showed interesting in the smart vegetable root cleaning method, suggesting they were open to exploring its full range of benefits, consistent with insights from Anand *et al*. (2021).

Interestingly, the attributes of the innovative vegetable washer—novelty, management efficiency, operational comfort, and a potential solution to labour shortages for vegetable washing—all played pivotal roles in its perceived acceptance. The progression of the study revealed that the participants placed a premium on the benefits and adaptability of the vegetable washer. Anand *et al*. (2021) suggested that its utility and user-friendliness were paramount for an innovation like the root vegetable washer, irrespective of the user's inherent innovativeness.

Furthermore, the study's findings underscored that the sample group's positive disposition towards the smart vegetable root washer spanned across various stages of the adoption process. This aligns with the findings of Jaikhun and Phothongsaengarun (2019), who highlighted the factors of technology acceptance and perception of benefits as critical determinants influencing adoption behaviour.

The high Beta coefficient (β=0.673) indicated that gender strongly influenced whether someone adopts this innovation and is found to be more potent than any other factor studied. This finding could be confirmed the important for targeting marketing and educational efforts, and indicated the underlying differences to the genders interact with or value this innovation.

Acknowledgments

The study was conducted with Human Ethics Study code EC-KMITL_66_046. This project was supported by the School of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang (KMITL), Bangkok, Thailand (Grant No 2566-02-04-023).

References

Agricultural Research Development Agency (2018). Agricultural Technology for Improving Efficiency in the Agricultural Sector. Retrieved from https://www.arda.or.th/detail/6182

Ali, D. A., Bowen, D. and Deininger, K. (2020). Personality Traits, Technology Adoption, and Technical Efficiency: Evidence from Smallholder Rice Farms in Ghana. Journal of Development Studies, 56:1330-1348.

Anand, J., McDermott, G., Mudambi, R. and Narula, R. (2021). Innovation in and from emerging economies: New insights and lessons for international business research. Journal of International Business Studies, 52:545-559.

Anwar, M., Zulfiqar, F., Ferdous, Z., Tsusaka, T. W. and Datta, A. (2021). Productivity, profitability, efficiency, and land utilization scenarios of rice cultivation: An assessment of hybrid rice in Bangladesh. Sustainable Production and Consumption, 26:752-758.

Asian Development Bank (2022). The Social Protection Indicator for Asia: Tracking Developments in Social Protection (0 ed.). Asian Development Bank. Retried from https://doi.org/10.22617/SGP220562-2

Cavite, H. J., Kerdsriserm, C., Llones, C., Direksri, N. and Suwanmaneepong, S. (2022). Farmers' perception of consumer information and adoption intention towards organic rice farming: Evidence from community enterprise in rural Thailand. Outlook on Agriculture, 003072702211352. https://doi.org/10.1177/00307270221135250

Chinseu, E. L., Dougill, A. J. and Stringer, L. C. (2022). Strengthening Conservation Agriculture innovation systems in sub-Saharan Africa: Lessons from a stakeholder analysis. International Journal of Agricultural Sustainability, 20:17-30.

Cremades, R., Wang, J. and Morris, J. (2015). Policies, economic incentives and the adoption of modern irrigation technology in China. Earth Syst. Dynam, 6:399-410.

Ebers, A., Trung, Nguyen, T. and Grote, U. (2017). Production efficiency of rice farms in Thailand and Cambodia: A comparative analysis of Ubon Ratchathani and Stung Treng provinces. Paddy and Water Environment, 15. https://doi.org/10.1007/s10333-016-0530-6

Fosso, P. K. and Nanfosso, R. T. (2016). Adoption of agricultural innovations in risky environment: The case of corn producers in the west of Cameroon. Review of Agricultural, Food and Environmental Studies 2016 97:1, 97:51-62.

Gonzalvo, C. M., Tirol, M. S. C., Moscoso, M. O., Querijero, N. J. V. B. and Aala, W. F. (2020). Critical factors influencing biotech corn adoption of farmers in the Philippines in relation with the 2015 GMO Supreme Court ban. Journal of Rural Studies, 74:10-21.

Hasan, I., He, Q. and Lu, H. (2020). The impact of social capital on economic attitudes and outcomes. Journal of International Money and Finance, 108, 102162. https://doi.org/10.1016/j.jimonfin.2020.102162

Jaikhun, M. and Phothongsaengarun, R. (2019). Technology acceptance, trust, and social media marketing affecting purchase intention through Facebook LIVE among generation X, Y, Z consumers. Academic Journal of Suvarnabhumi Institute of Technology, 5:260-275.

Kelly, S., Kaye, S. and Oviedo-Trespalacios, O. (2023). What factors contribute to the acceptance of artificial intelligence? A systematic review. Telematics and Informatics, 77:101925.

Lee, S. M. and Trimi, S. (2018). Innovation for creating a smart future. Journal of Innovation & Knowledge, 3:1-8.

Likert, R. (1932). A technique for measurement of attitudes. Archives of Psychology, 140:5-55.

Llones, C., Mankeb, P., Wongtragoon, U. and Suwanmaneepong, S. (2021). Bonding and bridging social capital towards collective action in participatory irrigation management. Evidence in Chiang Rai Province, Northern Thailand. International Journal of Social Economics, 49:296-311.

Lorente, D., Aleixos, N., Gómez-Sanchis, J., Cubero, S., García-Navarrete, O. L. and Blasco, J. (2012). Recent Advances and Applications of Hyperspectral Imaging for Fruit and Vegetable Quality Assessment. Food and Bioprocess Technology, 5:1121-1142.

Mariano, M. J., Villano, R. and Fleming, E. (2012). Factors influencing farmers' adoption of modern rice technologies and good management practices in the Philippines. Agricultural Systems, 110:41-53.

McHugh, M. L. (2013). The chi-square test of independence. Biochem Med (Zagreb), 23:143-149.

National Innovation Agency (2016). Innovative organization book of knowledge. Retrieved from https://ifi.nia.or.th/wp-content/uploads/2020/09/Innovative-Organization-BOOK_digital_09-2020.pdf

Oo, S. P. (2020). Farmers' awareness of the low yield of conventional rice production in Ayeyarwady region, Myanmar: A case study of Myaungmya district. Agriculture, 10, 26. https://doi.org/10.3390/agriculture10010026.

Rakshit, S., Islam, N., Mondal, S. and Paul, S. T. (2022). An integrated social network marketing metric for business-to-business SMEs. Journal of Business Research, 150:73-88.

Rajkhowa, P. and Qaim, M. (2022). Mobile _off-farm employment and household income in rural India.pdf." Journal of Agricultural Eco-nomics 73:789-805. https://doi.org/10.1111/1477-9552.12480.

Westermann, O., Forch, W., Thornton, P., Korner, J., Cramer, L. and Campbell, B. (2018). Scaling up agricultural interventions: case studies of climate-smart agriculture. Agricultural System, 165:283-293, 10.1016/j.agsy.2018.07.007

Zhou, J.-h., Li, K. and Liang, Q. (2015). Food safety controls in different governancestructures in china's vegetable and fruit industry. Journal of IntegrativeAgriculture 14:2189-2202.

(Received: 21 September 2024, Revised: 6 January 2025, Accepted: 10 January 2025)