



Systematic Research on the Use of Higher Education, Science, Research, and Innovation for Learning Enhancement and Employment for the Elderly in the Agricultural Sector

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ABSTRACT

Thailand is becoming an aged society with 20 percent of the total population aged 60 years and over. The objectives of the study consist of 1) to examine the elderly informal workers' needs in skill development, attitudes toward work, and government assistance; and 2) to design mechanisms to improve learning for the elderly in the agricultural sector. The analysis focused on the data set gathered from 500 individuals aged 60 years and over who were currently working in the informal sector at the time the survey was conducted. The informal sector is categorized into four groups: business owners and skilled workers, store or online sellers, farmers and fishery workers, and general contractors and low-skilled workers. The study incorporates in-depth interviews and focus group meetings with experts from the public, private, academic, and community sectors. The findings show that the three most demanded skills development for elderly workers in the agricultural sector are health development, entrepreneurship, and self-employment skills. The three most valued attitudes are adaptation to the work environment, adaptation to colleagues, and work stress management. The three most needed government assistance are welfare, continuous employment, and fair compensation. Government organizations can take part in nurturing elderly career opportunities and increase capacity development by encouraging people of all ages to apply modern technology in the management of local enterprises to drive more effective measures for the elderly agricultural workers in rural areas. This allows the elderly to learn how to utilize information technology from the younger generations such as online marketing, new distributor sourcing, and resource management. The elderly, in return, exchange their agricultural wisdom with younger generations which enhances their role in the local communities.

1. INTRODUCTION

Thailand is an aging society that will soon transform into an aged society (Foundation of Thai Gerontology Research and Development Institute, 2020). In 2019, the elderly population (aged 60 years and over) is 17.5 percent of the total population, or 11.6 million people, and the working-age population (aged 15 to 59 years) is 65.4 percent of the total population. It is estimated that in 2022, the elderly population will increase up to 20.7 percent of the total population, or 14.5 million people, whereas the working-age population will reduce to 55.7 percent of the total population. The increasing elderly population and the declining working-age population will force Thailand to face a shortage of workers in the future.

Policy improvements are required to drive various measures to support Thailand's upcoming aged society in

the areas of health, economy, environment, and communities. For example, health care support and retirement savings for the working-age population; supporting elderly employment through re-skilling or post-retirement vocational training; educating the elderly and their close connections about the elderly's health, law, and rights; encouraging the elderly to interact with their communities; and decentralize to local elderly supports through policies. The policies should focus on improving the elderly's quality of life and increasing self-reliance to reduce dependency. The World Health Organization's concept of active aging addresses three key elements: good health, guarantee, and stability in life, and social participation [1].

As for elderly employment, some elderly believe that they can continue to work, be part of society, and retain their income for subsistence; however, the majority of the elderly no longer want to work even though they are in good health.

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The elderly with good health should be encouraged to seek employment for skills development and see the importance of working. Working elderly has positive impacts at the individual level, having a stable income and being part of society, and at the national level, reducing labor shortage and the burden on government welfare.

Each elderly group has a different context such as those in urban and rural settings with different lifestyles, occupations, health conditions, knowledge, and skills. They have different needs which require different learning and employment support. The existing research, recommendations, and guidelines for promoting elderly employment mostly emphasize its application to the elderly in general. We must recognize the importance of research studies to enhance learning and employment suitable for each elderly group with informal employment.

The main objectives of this study are (a) to study the elderly informal workers' need for skill development, attitudes toward work, and government assistance and (b) to use the system and mechanism design and the higher education, science, research, and innovation to enhance learning and employment suitable for the elderly in the agriculture sector. We focus on the role of the Ministry of Higher Education, Science, Research, and Innovation to define and promote elderly employment. This helps encourage the elderly to work to increase their life quality and the country's workforce to support the aged society. Research studies on the higher education, science, research, and innovation capabilities to support learning and employment in the elderly will be beneficial to policy formulation, mechanisms, and relevant agencies in the future.

The paper is organized as follows. Section II discusses the literature review related to promoting elderly employment and enhancing e-learning and digital literacy among the elderly. Section III gives an overview of the employment situation of the Thai elderly. Section IV describes the conceptual framework and methodology. Section V discusses the results. Section VI highlights the conclusion and policy recommendations.

2. LITERATURE REVIEW

According to several international research studies on promoting elderly employment, there are limited studies specifically on elderly informal workers. The nature of policies, regulations, and guidelines on the promotion of elderly employment only relate to working in the formal system with the semi-informal nature of part-time employment. The policies proposed in each country have similar incentives for private companies or agencies to recruit the elderly and to create a work system favorable for the elderly. It creates incentives to encourage the elderly to continue working such as extension of retirement age, physical and psychological health support, equal human dignity, and importance of education. A summary of the

overall comparison between good practices for promoting elderly employment used in six countries [2]-[11] is presented in Table 1.

Table 1: Summary of best practices for promoting elderly employment

Best practices	Countries					
	USA	Hong Kong	Taiwan	UK	Turkey	EU
Legislation on age discrimination	✓		✓	✓		✓
Employer subsidies		✓	✓			✓
Employee subsidies	✓	✓	✓			✓
Recruitment support	✓	✓	✓	✓		✓
Knowledge support and skill training of the elderly and relevant agencies	✓	✓	✓	✓	✓	✓

Source: Compiled by the research team.

These practices emphasize four areas: the employment age limitation, the availability of welfare assistance for elderly workers, encouraging elderly workers to return to the labor market through legal measures, and providing financial support for employers and elderly workers. The success factors of each country should start from the national policy and be in the government's priorities. To achieve a welfare state is to have continuous care and support for elderly employment, such as financial support for employers and elderly workers and well-established laws. In Taiwan, there are not just only incentives for companies to support the employment of elderly workers but there are laws to protect workers' rights and enforce penalties [9].

Several research studies have recommended four approaches to encourage formal elderly employment in Thailand: re-employment, the extension of retirement age, flexible employment, and independent hiring [12]-[20]. Thailand focuses on promoting elderly employment through cooperation mechanisms of different sectors with an emphasis on promoting independent careers in the form of community enterprises. The measure for elderly employment is through cooperation with large private companies operating under the elderly employment project. Although this method is limited within the country and does not encourage retired workers to return to the labor market through incentives for employers and workers as in other countries, it does encourage informal employment. According to the studies [20]-[26], it is preliminarily concluded Thailand's good practices and recommendations

on the promotion of informal elderly employment. Local government organizations play a major role in promoting Thai elderly employment.

In addition to promoting elderly employment, enhancing e-learning, technology, and digital literacy among the elderly is essential. The COVID-19 pandemic has emphasized the importance of having the digital skills to operate technology in remote work environment [27]-[29]. The study found that the acceleration of the shift to online or remote working brings new opportunities, but it also brings potential inequalities in the labor market [30]. The study reviewed that older workers with more digital skills have significantly higher earnings and are better positioned to compete for the jobs [30]. The majority of the working elderly in Thailand work in the agriculture sector as shown in Table 2. Thailand's agricultural sector is facing the issue of labor scarcity, more than half of farmer households are aging workers, and limited access to new knowledge and technology [31]. There is positive evidence for enhancing e-learning and digital literacy in the agriculture sector [32]-[38]. The enhancement of tea farmers' digital literacy has a significant impact on the intelligent development and transformation of the tea industry [32]. The research study extended the original model of the unified theory of acceptance and use of technology (UTAUT) by introducing the personal innovativeness theory and the self-efficacy theory and found that the age of tea farmers had a significant

positive moderating effect on the improvement of digital literacy behavior through the facilitating conditions [32]. When tea farmers learn to improve their digital literacy and can apply the intelligent agriculture model to improve tea production effectively and sell their products through digital platforms, this will enhance their willingness to improve their digital literacy [33,34]. In addition, the study showed that the farmers who participated in the integrated farmer field school program where they learned about scientific knowledge, skills, positive attitudes, and technology, their paddy productivity increased significantly [35]. Therefore, the positive results from learning at the integrated farmer field school reinforced the farmers to adopt agricultural technologies for increased productivity [35]-[38].

3. THE EMPLOYMENT SITUATION OF THE THAI ELDERLY

According to the National Statistical Office's survey on Thailand's elderly employment in 2020 (Table 2), it is found that 36.9 percent of the total elderly population, or 4,704,477 out of 12,747,476 elderlies, has employment. 87.1 percent of the total number of employed elderly, or 4,097,811 elderly, are informal workers. 60.8 percent of the total number of informal elderly workers, or 2,858,907 elderlies, work in the agricultural sector (National Statistical Office, 2020).

Table 2: Statistics of the working elderly, 2017-2020

	Statistical data of working elderly	Year			
		2020	2019	2018	2017
1	Total number of elderly (persons)	12,747,476	12,269,291	11,803,530	11,350,000
2	Number of working elderly (persons)	4,704,477	4,235,680	4,361,331	4,063,076
3	Percentage of elderly working (%)	36.91	34.52	36.95	35.80
4	Number of in formal labor working elderly (persons)	606,666	507,102	513,711	477,271
5	Number of informal labor working elderly (persons)	4,097,811	3,728,578	3,847,620	3,585,805
6	Percentage of in formal labor working elderly (%)	12.9%	12.0%	11.8%	11.3%
7	Percentage of informal labor working elderly (%)	87.1%	88.0%	88.2%	88.3%
8	Average number of working hours per week (hour)	38.5	39.9	39.6	40.8
9	Number of working elderlies classified by industry (persons)				
	9.1 Agriculture sector (Agriculture, forestry, and fisheries)	2,858,907	2,555,931	2,626,003	2,388,431
	9.2 Non-agricultural sector	1,845,570	1,679,749	1,735,328	1,674,645
	- Wholesale, retail, repair of motor vehicles	660,537	600,479	620,004	625,133
	- Production	348,745	319,595	338,373	323,929
	- Accommodation and food service	270,691	245,247	243,338	222,500

	- Construction	126,440	117,123	129,406	103,204
	- Other services	97,686	85,599	80,757	86,675
	- Transportation, storage	88,599	78,550	86,342	73,562
	- Public administration and defense	57,546	58,800	56,165	47,980
	- Administrative activities and support services	38,291	31,378	31,091	39,020
	- Education	36,941	41,273	41,710	39,723
	- Private household employment	29,171	24,205	21,005	27,601
	- Real estate business	22,841	18,452	20,788	23,630
	- Health and social work	18,756	17,675	19,747	14,381
	- Arts, entertainment and recreation	17,232	13,068	15,025	13,922
	- Professional science and vocational activities	12,264	7,971	12,895	10,206
	- Financial and insurance activities	9,519	11,336	7,837	6,659
	- Mining and quarrying	3,742	1,789	3,519	3,604
	- Water supply, management and wastewater treatment	2,469	1,938	3,536	8,465
	- Information and communication	2,192	947	1,212	2,494
	- Electricity, gas and waterworks	845	1,105	2,038	1,957
	- Don't know	1,063	3,219	540	-
10	Number of working elderlies classified by working status)person)				
	10.1 Private business	2,932,130	2,629,106	2,691,884	2,502,775
	10.2 Helping household businesses	962,278	865,287	879,726	811,381
	10.3 Private employees	561,394	473,188	532,858	495,144
	10.4 Employer	142,184	155,881	147,330	153,295
	10.5 Government employees	101,344	107,849	104,741	90,299
	10.6 Group activities	5,147	4,369	4,792	10,182

Source: (National Statistical Office, 2017, 2018, 2019, 2020)

Note: Industrial classification according to Thailand Standard Industrial Classification, (TSIC) 2009, revised by the National Statistical Office. The classification of working status is based on the International Classification of Status in Employment, 1993 (ICSE – 93) of the International Labor Organization (ILO).

The age of retirement and age of eligibility to receive pension benefits in the Thai employment system [39] are illustrated in Table 3. All formal workers in the public sector retire at the age of 60 while the workers in the private sector retire depending on the negotiation between employees and employers. The age of eligibility to receive pension benefits and senior allowances for public formal workers is between 50 to 60 years. The age of eligibility to receive social security for private formal workers is 55 years. There is no specific legal age of retirement for informal workers. Informal workers are ineligible for any pension scheme. An appropriate social welfare as well as housing environment for the elderly still need further studies for a sustainable solution [40,41].

4. CONCEPTUAL FRAMEWORK AND METHODOLOGY

A mixed method, both quantitative and qualitative, is applied to this study.

4.1 Collect questionnaire surveys to study the characteristics and employment needs of the elderly

The project has conducted a field survey using multi-stage sampling of the target populations in 5 regions: (1) Bangkok and its vicinity, (2) the central region, (3) the northern region, (4) the northeastern region, and (5) the southern region. According to the 2011 Bangkok Metropolitan Region Population Study by the Office of Town and Country Planning, the vicinity consists of 5 provinces: Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan,

and Samut Sakhon. The sampling group consists of 500 informal workers aged 60 to 69 years from 2 provinces in each of the 5 regions (Table 7). The sampling of specific contributors was based on specified attributes. The sample group of 50 people per province includes those who live in urban and rural areas. The data from the questionnaire will be used 1) to analyze the possibility of occupational characteristics and suitable future career prospects or job opportunities for the elderly; and 2) to analyze the supporting factors of elderly employment and preparation of the pre-aging population in areas of skill development, conceptual change, and behavioral modification to realize the importance of learning and employment in the elderly.

Table 3: Age of retirement and age of eligibility to receive pension benefits in the Thai employment system

Employment sector	Formal workers		Informal workers (e.g., agriculture and self-employed, etc.)
	Public sector	Private sector	
Age of retirement	60 years	No specific legal requirement. Depends on the agreement between employees and employer	Age of retirement
Age eligibility to receive pension and age eligibility to receive senior allowances	50 to 60 years	From 55 or 60 years according to the age indicated in Social Security rights after completing Social Security contributions for 180 months.	Age eligibility to receive pension and age eligibility to receive senior allowances

Source: (Chamchan, 2008)

Conduct focus group meetings and in-depth interviews.

Three focus group meetings were conducted to discuss and seek recommendations from the government, private sector, education sector, local community, and related agencies such as the Office of the National Economic and Social Development Council, Ministry of Labour, Office of the Permanent Secretary, Office of Provincial Labour, Labour Department, Employment Department, Skill Development Department, Labour Protection and Welfare Social Security Office, Ministry of Social Development and Human Security, Department of Elderly Affairs, local government organizations involved in the project, establishments that promote employment of the elderly, non-profit organizations engaged in the promotion of elderly work, educational institutions, and community enterprises.

Conduct in-depth interviews with experts on the system and mechanism design; use of higher education, science, research, and innovation to enhance learning and employment suitable for each informal elderly worker group; and make policy recommendations.

Table 4: Details of surveyed provinces and the number of samples

Province	District 1	District 2	Number of samples
Bangkok and its vicinity			
1. Bangkok	Pom Prap Sattru Phai	Nong Chok	50
2. Nonthaburi	Muang	Bang Yai	50
Central			
Chonburi	Muang	Phanat Nikhom	50
Suphan Buri	Muang	Sam Chuk	50
North			
Chiang Mai	Muang	apocalyptic	50
Phitsanulok	Muang	Bang Krathum	50
Northeast			
Nakhon Ratchasima	Muang	Pakthongchai	50
Loei	Muang	Wang Saphung	50
South			
Nakhon Si Thammarat	Muang	Thung Song	50
Trang	Muang	Kantang	50
Total	20 districts		500

Source: Calculated by the research team.

5. RESULTS

5.1 Analysis of overall characteristics and needs of informal elderly employment groups (aged 60 years and over)

The data was collected from 10 provinces: Bangkok, Nonthaburi, Chonburi, Suphan Buri, Chiang Mai, Phitsanulok, Nakhon Ratchasima, Loei, Nakhon Si Thammarat, and Trang. 50 samples of informal workers were collected in each province and were classified by occupation group: 1) executives, business owners, and skilled workers; 2) agriculture and fishery workers; 3) Store or online sellers, such as those selling food or handicrafts; and 4) general workers and low skilled workers. Approximately 78 percent of respondents feel that their health conditions did not cause any work-related problems.

The elderly informal workers' average income from high to low by occupational group are 1) executives, business owners, and skilled workers; 2) store or online sellers; 3) farmers and fisheries; and 4) general contractors and low-skilled workers. The mean wage difference between the group receiving the highest wage was more than three times higher than the group receiving the lowest wage (Table 5). The monthly payments are aligned with the debt balance (Table 6). The main source of loans for workers comes from commercial banks, financial institutions, neighboring creditors or capitalists, cooperatives, community welfare funds, and village funds.

The education levels were classified into 4 groups: 1) primary school and below; 2) secondary education and general vocational school with certificate; 3) high vocational school with diploma; and 4) tertiary education. The majority of the sample group's educational level from most to least are at primary school and below, secondary education, and tertiary education. When classified by occupation group, the majority of the samples with primary and below education level are in the general contractors and low-skilled workers group while those with tertiary education are in the executives, business owners, and skilled workers group (Table 7).

The average years of employment in the current workplace were 22 years for business owners, 24 years for agricultural workers, 17 years for sellers, and 16 years for low-skilled workers. The average total years of work experience is approximately 40 years.

Table 8 indicates the need for government support by occupational groups of informal elderly workers. The most needed government supports are rights and welfare, self-

employed capital and credit, continuous employment, and appropriate accommodation and workplace conditions. Each occupational group of informal workers needs different government support. In the business owners and skilled workers group, the top three needs are welfare and rights, continuous work, and self-employed capital and credit. In the agriculture and fishery group, the top three needs are welfare and rights, product price increase, and market and distribution channel expansion. In the seller group, the top three needs are welfare and rights, continuous work, and market and distribution channel expansion. In the low-skilled worker group, the top three needs are welfare and rights, continuous work, and self-employed capital and credit. Government agencies may utilize the data to provide better assistance to different target groups according to their desired needs.

The top three work attitudes of the elderly most valued by the respondents are how the elderly can adapt to the working environment, how the elderly can adapt to their colleagues, and how the elderly manage work stress as shown in Table 9. The elderly informal workers' most needed skill development in all labor groups is health development. The second most needed skill development in business owners, skilled workers, and low-skilled worker's groups are independent employment and information technology skills. The second most needed skill development in agriculture and fishery workers and store or online sellers are entrepreneurial and independent employment skills. Identifying demands allows relevant agencies to design skill development courses according to the needs of the target audience (Table 10).

Table 5: Descriptive statistics of main income (working wages) per month by occupational group of informal elderly workers

Occupational group	Main income (working wages) Baht per month, including cases = 0				
	Mean (Standard Deviation)	Median	Mean (Standard Deviation)	Maximum value	Mean (Standard Deviation)
Executives, Business owners, and skilled workers	33,713.11 (51,975.83)	Executives, Business owners, and skilled workers	33,713.11 (51,975.83)	Executives, Business owners, and skilled workers	33,713.11 (51,975.83)
Agriculture and fishery workers	10,511.11 (9,592.10)	Agriculture and fishery workers	10,511.11 (9,592.10)	Agriculture and fishery workers	10,511.11 (9,592.10)
Store or online sellers	14,793.46 (11,817.10)	Store or online sellers	14,793.46 (11,817.10)	Store or online sellers	14,793.46 (11,817.10)
General and low-skilled workers	8,557.69 (5,119.12)	General and low-skilled workers	8,557.69 (5,119.12)	General and low-skilled workers	8,557.69 (5,119.12)
Others	8,512.50 (9,237.31)	Others	8,512.50 (9,237.31)	Others	8,512.50 (9,237.31)
Total	16,415.40 (28,556.05)	Total	16,415.40 (28,556.05)	Total	16,415.40 (28,556.05)

Table 6: Descriptive statistics of monthly debt payments by occupational group of informal elderly workers

Occupational group	Monthly debt payments (Baht per month), including cases = 0				
	Mean (Std. Dev.)	Median	Minimum	Maximum value	Quantity
Executives, Business owners, and skilled workers	11,618.52 (25,616.36)	2000	0	118,200	61
Agriculture and fishery workers	1,477.24 (3,566.14)	0	0	20,000	79
Store or online sellers	2,653.51 (4,177.83)	1000	0	20,000	57
General and low-skilled workers	1,632.95 (2,872.44)	595	0	20,000	112
Others	4,100 (5,064.58)	1000	0	14,000	15
Total	3,768.74 (12,110.59)				324

Table 7: Level of education by occupational group of informal elderly workers

Occupational group	Level of education				
	Primary school and lower	Secondary education	High Vocational education	Tertiary education	Total
Executives, business owners, and skilled workers	44	17	48	48	122
Agriculture and fishery workers	67	25	5	5	99
Store or online sellers	62	27	15	15	107
General and low-skilled workers	102	40	5	5	156
Others	3	3	7	7	16
Total	278	112	80	80	500

5.2 System and mechanism design for the use of higher education, science, research, and innovation to raise the level of learning and employment that are suitable for agricultural workers (aged 60 years and over) in rural areas

A mixed method, both quantitative and qualitative, produces depth and clarity of survey results (Figure 1), it is found that elderly agricultural workers' highest attitudinal score is adaptation to colleagues and the work environment, and the lowest score is technology adaptation. Their most to least needed government support are 1) welfare and rights, product value increase, market and distribution channel expansion, continuous job, fair compensation, and independent work capital; and 2) business mentoring and professional skill development. Their most to least needed skill developments are 1) entrepreneurial skills, health improvement, independent employment skills, marketing, and e-commerce skills; and 2) language and communication skills.

Some informal elderly workers with agriculture-related occupations also have supplementary occupations in the local area by relying on local wisdom to create products, such as silk, food products, and handicrafts. The needs of the elderly who engage in supplementary occupations based on local wisdom can be summarized as shown in Table 11.

A policy by the Ministry of Public Health encourages the elderly to have an occupation and earn income by becoming a Village Health Volunteer (VHV) or a caregiver in their local communities. The role of the Ministry of Higher Education, Science, Research, and Innovation should support the Ministry of Public Health's policy by incorporating knowledge from local universities and developing health training courses for the VHV and caregivers. The courses may be designed to help develop health-related knowledge and may be collected as credit for a certificate with a higher income prospect.

Table 8: Need for government support by occupational group of informal elderly workers

Occupational group	Government support											
	Skill development	Fair compensation	Labor market information	Self-employ capital	Welfare benefits and rights	Legal support	Continuous employment	Workplace and accommodation conditions	Product price increase (value-adding method)	Market and distribution channel expansion	Promote the gathering of occupation groups or community enterprises	Business mentor
Executives, business owners, and skilled workers	1.1803	2.1557	1.4262	2.4918	3.4180	2.1066	2.9672	1.9426	2.2049	2.4836	2.25409	1.4590
Agriculture and fishery workers	2.2828	3.2020	2.3838	3.1818	4.1313	2.6364	3.2828	2.6768	3.8283	3.3434	2.9596	1.6969
Store or online seller	1.7570	3.2243	1.9065	2.3084	4.0748	2.1308	3.0561	2.5327	2.4953	2.8879	2.4953	1.5607
General and low-skilled workers	1.9679	3.5	1.8718	2.8526	4.2564	2.1859	3.6538	2.4231	2.1154	2.1859	2.2244	1.3205
Others	2.4375	2.6875	2.125	3.5625	3.8125	3	3.4375	3.4375	3.375	3.125	3.0625	2.375

Table 9: Work-related attitudes towards informal elderly workers by occupational group

Occupational group	Work-related attitudes							
	Health of the elderly is not a problem for work	Elderly can get stress from work.	Elderly can adapt to the technology	Elderly can adapt to the work environment	Elderly can adapt to their colleague	Elderly can effectively receive development training	Elderly can work more efficiently	Elderly is not a problem for the organization
Executives, business owners, and skilled workers	2.8115	3.0984	3.1803	3.6230	3.7623	3.4426	3.5574	3.5246
Agriculture and fishery workers	3.0707	3.3535	2.8384	3.7374	3.7778	3.4545	3.5859	3.5051
Store or online sellers	3.1308	3.2804	3.0093	3.5607	3.6729	3.2617	3.5607	3.4019
General and low-skilled workers	2.9423	3.1859	2.7564	3.5513	3.7308	3.2885	3.4872	3.3782
Others	3.3125	3.5	3.125	3.875	3.6875	3.3125	3.375	3.25

Table 10: Need for skill development by occupational group of informal elderly workers

Occupational group	Skill development							
	Entrepreneurial Skills	Language and communication skills	Independent work skills	Information technology skills	Marketing and e-commerce skills	Personality management skills	Health skills	Other skills
Executives, business owners, and skilled workers	0.2049	0.1557	0.2295	0.2131	0.1803	0.1475	0.3525	0.0082
Agriculture and fishery workers	0.2222	0.1010	0.2121	0.1414	0.1515	0.0606	0.2222	-
Store or online sellers	0.2243	0.1402	0.1963	0.1776	0.1215	0.1402	0.3364	-
General and low-skilled workers	0.1346	0.1154	0.1987	0.1538	0.0962	0.1026	0.2692	-
Others	0.4375	0.3750	0.4375	0.4375	0.3125	0.3125	0.4375	-

Table 11: The needs of the elderly with supplementary occupations and the role of the Ministry of Higher Education, Science, Research, and Innovation

The needs of the elderly who engage in supplementary occupations such as silk weaving, food product, and textile work.	The role of the Ministry of Higher Education, Science, Research, and Innovation.
1. Want access to the capital for occupation.	1. Provide 2-to-5-year long-term research funding to higher education institutions, social entrepreneurs, and independent organizations for job creation, nurturing career opportunities, product quality research and development (R&D), packaging development, and technological knowledge guidance to the working age group to help improve the work efficiency of the elderly. 2. Encourage universities or higher education institutions to follow the student project “Thammasat Model” or participate in the establishment of community enterprises. 3. Create a system to transfer local wisdom to children, youth, and the working age population. Build knowledge for entrepreneurship through cooperation from local higher education institutions, entrepreneurs, and government organizations.
2. Want to improve product quality and receive standard certification that certify the quality of products as good, clean, and safe.	
3. Want to develop product packaging to be modern, attractive, and beautiful.	
4. Need a variety of sales channels in-store and online, such as OTOP centers, souvenir shops in the province, department stores, websites, and applications such as Lazada and Shopee.	
5. Need knowledge in inventory management and accounting system.	
6. Need working elderly, young people, and social entrepreneurs to help support the elderly in using technology to access to knowledge and new management methods.	

Some local elderly need new supplementary occupations. The Ministry of Higher Education, Science, Research, and Innovation may contribute to the creation of new occupations for the local elderly as follows: 1) the development of local homestays along tourism routes for the elderly to earn income from accommodation and food services for tourists, 2) tour guides training for the elderly in tourist provinces, and 3) Thai traditional massage training for the elderly to earn income from massage service in the village.

The role of the Ministry of Higher Education, Science, Research, and Innovation is to support the group of informal agricultural workers in rural areas aged 60 years and over. They can aid through an integrated sub-district socio-economic upgrade project “One Tambon, One University”. It is considered a project that initiates an integration with the local universities as an integrated project unit (System Integrator). Relevant agencies may participate in employment, economic, and social rehabilitation which cover a wide range of issues according to the problems and needs of the community. It is necessary to focus on sustainable development, extension, and productivity to have continuous income and promote career development. Agricultural workers do not need to change careers but need to have more knowledge, techniques, methods, and technologies suitable to their age range. The Ministry of Higher Education, Science, Research and Innovation, the Ministry of Agriculture and Cooperatives, and the Ministry of Labor must cooperate to develop a project to promote and support agricultural careers. The roles of organizations related to informal elderly workers in rural agricultural areas are shown in Table 12.

Examples of policy recommendations for the elderly through the work system of various agencies in the case of local government organizations being involved in the management of enhancing work opportunities for the elderly are shown in Figure 1.

Table 12: Organizations responsible for different curriculums related to informal elderly workers in rural agricultural areas

Responsible organization		Example project or course
Ministry	Agency	
Ministry of Agriculture and Cooperatives	Department of Agricultural Extension	Food stability promotion project to improve the life quality among elderly women in the agricultural sector.
	The Queen Sirikit Department of Sericulture	Mulberry Silk Occupational Project for the disabled and the underprivileged elderly.
Ministry of Interior	Office of the Local Government Pension Fund Department of Local Administration	Loan for the underprivileged elderly, individually and in groups.
	Department of Local Administration	1. Projects to promote and support local government organizations to organize vocational skills training or appropriate vocational training for the elderly. 2. Projects to promote and support local administrative organizations to provide useful information on elderly healthcare. 3. Projects to provide subsidy to promote elderly organizations and network partners to participate in the operations. 4. Projects to build income security for the elderly. 5. Projects to promote and support local government administration to provide basic facilities for the elderly.
	Community Development Department	OTOP Senior product quality development project for the elderly aged 60 years and over.
	Department of Elderly Affairs	1. Loan for the underprivileged elderly, individually and in groups. 2. Project to enhance the power of wisdom to develop into community
Ministry of Labor	National Housing Authority	products. 3. Project to develop capacity and promote learning for the elderly in the community. 4. Project to promote elderly learning and training. 5. Project to drive standards of care for the elderly. Elderly Potential Development Project
	Department of Labor Protection and Welfare	Welfare promotion project to improve the life quality of elderly workers.
	Office of the Permanent Secretary, Ministry of Labor	Informal workers, elderly workers, and disabled workers management project.
	Department of Skill Development (DSD) (Provincial Skill Development Institute)	1. Training project for DSD Smart Farmer course 2. Agriculture and food processing group course - 30 hours course to upgrade the processing of agricultural products with technology to increase value added, such as soap making.
Ministry of Health	Working in groups to prepare plans and guidelines for health systems development to support aged society.	Guidelines for health system development to support the aged society by the Ministry of Health and integrated plans for health system development to support the aged society by the Ministry of Health 2020-2022.
	Department of Health Service Support	Project to develop a seamless elderly care system.
	Medical department	1. Health service project for the elderly in an integrated health care facility. 2. Projects to develop a fall prevention and health care system for the elderly.
	Department of Disease Control	Influenza vaccination support program for the elderly.
Ministry of Higher	Chiang Mai University	Innovation and technology database

Education, Science, Research, and Innovation		development project for independent living facilities for the elderly in the community.
	Ministry of Higher Education, Science, Research, and Innovation; 76 universities; Ministry of Social Development and Human Security; Ministry of Health; Office of the National Auditor-General; Department of Medical Services; Digital Government Development Agency; Ministry of Interior; Department of Community Development; Department of Lands; Damrongtham Center; Office Of Information Technology; Office of the Judiciary; 14 court offices; 10 provincial agricultural economic offices; and Social Security offices	The integrated sub-district economic and social upgrade project, One Tambon, One University, aims to enhance the integrated economy and society by sub-district while utilize universities as the System Integrator. Employment, economic and social rehabilitation cover various issues according to the problems and needs of the community and the preparation of the big data of the community. The activities are as follows: 1) creation and development of careers, such as upgrading OTOP products or other occupations; 2) creation and development of creative economy, such as upgrading tourism; 3) applying knowledge to help community services, such as health care and technology in various fields; 4) environmental promotion and circular economy, such as increasing revolving income for the community)Community Big Data).

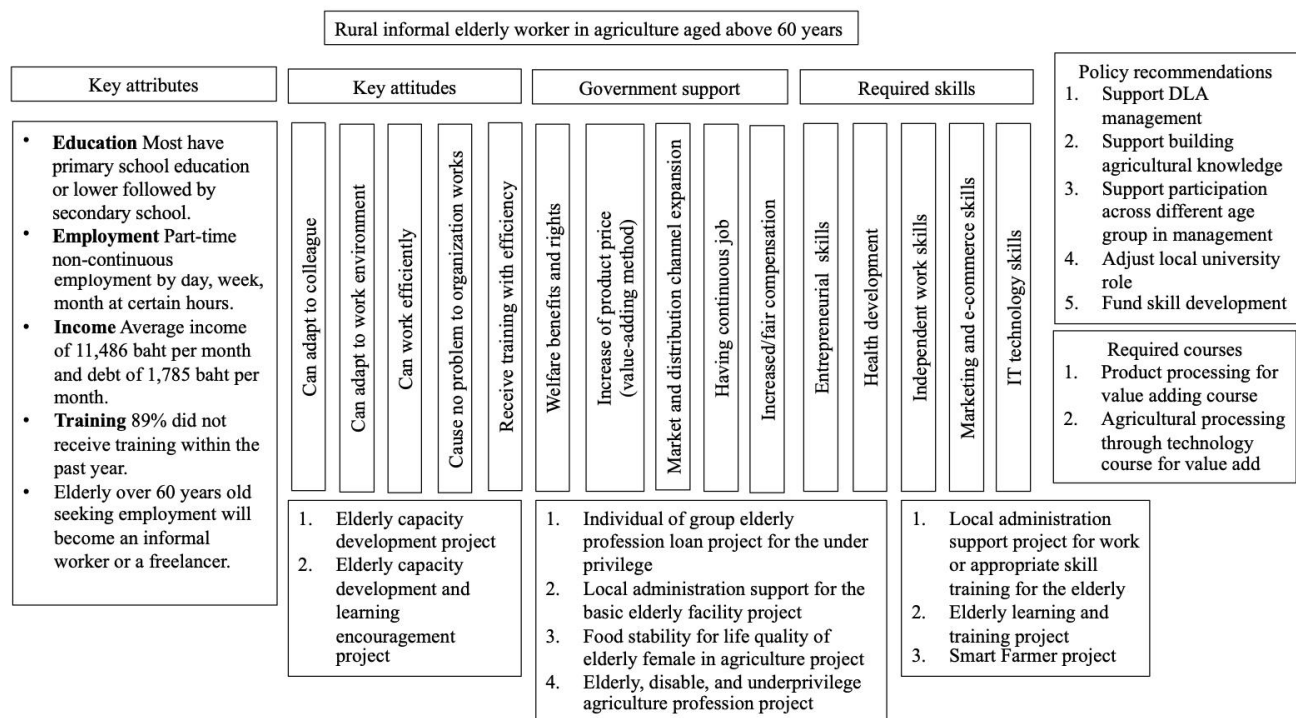
The local government organizations may collect information related to the needs of the elderly by collaborating with the Provincial Statistical Office and local educational institutions to survey the target population. The data will be utilized to formulate plans for social development in the form of employment promotion plans for the target group and integrate relevant agencies according to various target groups such as new agricultural knowledge. The local government organizations may cooperate with the Ministry of Agriculture and Cooperatives and local educational institutions, such as Rajabhat University, Rajamangala University of Technology, and community colleges, to create training courses to develop the elderly's potential in the agricultural sector to increase productivity, manage agricultural plots with modernized methods, utilize technologies in agricultural management, and contact agencies for credit to those in the agricultural sector, such as

Bank for Agriculture and Agricultural Cooperatives who lend low-cost loans to farmers who need funds for changing to more efficient production methods. For new marketing management and marketing promotion strategies, such as online marketing, local government organizations may cooperate with the Department of Business Development Ministry of Commerce and the Office of SMEs Promotion to organize training course programs for the target group. The local government organizations may also cooperate with the private sector through joint projects to provide knowledge and employment. The project may aim to hire more elderly by negotiating appropriate wages and compensation which does not contradict any relevant laws. In addition, the Ministry of Higher Education, Science, Research and Innovation (MHESI) may consider which technologies to use in the local government organization's work, such as nanotechnology to increase agricultural production or preserve agricultural product longevity, agricultural product processing, packaging technology, and modern training platform. The MHESI can raise attitude awareness and the welfare of the elderly through the learning tool kit model.

6. CONCLUSION AND POLICY RECOMMENDATIONS

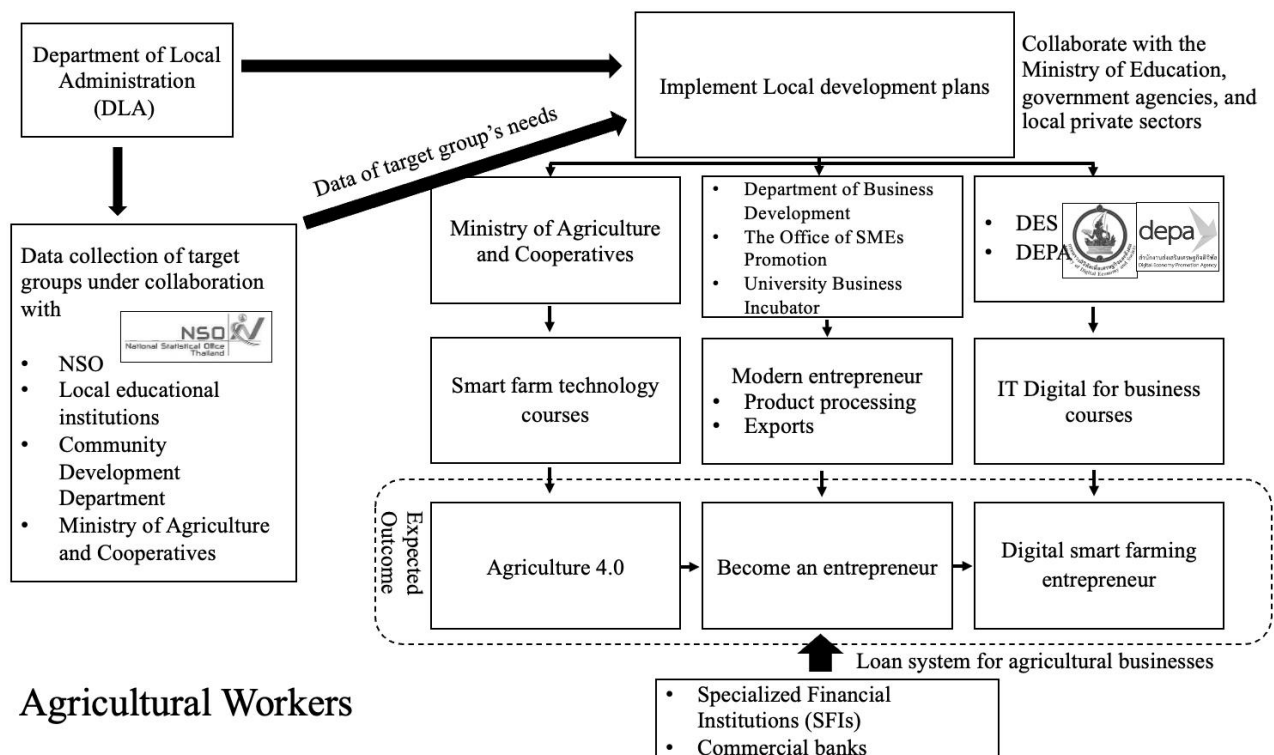
The contribution of this study is provided by using a mixed method, both quantitative and qualitative, to increase the depth and clarity of the survey results. The analysis shows that the most needed government support are rights and welfare, self-employed capital and credit, continuous employment, and appropriate accommodation and workplace conditions. Each occupational group of informal workers needs different government support. In the business owners and skilled workers group, the top three needs are welfare and rights, continuous work, and self-employed capital or credit. In the agriculture and fishery workers group, the top three needs are welfare and rights, product price increase, and market and distribution channel expansion. In the product seller group, the top three needs are welfare and rights, continuous work, and market and distribution channel expansion. In the low-skilled workers group, the top three needs are welfare and rights, continuous work, and self-employed capital and credit.

The most needed skill development and prioritized in all informal worker groups aged 60 years and over was health development skills. In business owners, skilled workers, and low-skilled workers group, independent employment and information technology skills are the second most needed skills. In agriculture, fishery, and store or online sellers' groups, entrepreneurial and independent employment skills are the second most required skills. These different skill requirements allow relevant agencies to design specific skill development courses for each target audience.



Source: Compiled by the research team.

Fig. 1. System and mechanism design for higher education, science, research, and innovation to raise the level of learning and employment suitable for informal elderly workers in the rural agriculture sectors.



Source: Compiled by the research team.

Fig. 2. In the case of local government organizations being involved in the management of enhancing job opportunities for the elderly.

Focus group meetings and in-depth interviews with experts from various public, private, academic, and community sectors revealed consistent outcomes with the survey. Information technology and e-commerce skills must be introduced to the elderly for existing businesses to survive in the current and future markets. The roles of higher education, science, research, and innovation to enhance learning and employment should collaborate with different partners. To drive more effective measures or policies for elderly agricultural workers in rural areas, the following additional actions may be taken:

1) Roles of local government. Encourage local government organizations nearest to the elderly to take part in nurturing career opportunities. Activities should be organized to bring out the potential of the elderly as models for wisdom exchange. The local government organizations are located closer and understand the needs of the local communities better than the regional and central government agencies.

2) Knowledge sharing. Promote knowledge sharing relevant to the agricultural sector that can be applied immediately and at a low cost. Agricultural courses may be implemented to increase productivity, promote new sources of agricultural-related income, and create learning resources for education. The local elderly may be employed in the management or operation part of homestay tourism which generates income for the elderly households and communities.

3) Capacity development. Increase capacity development by encouraging people of all ages to participate and apply modern technology in the management of local enterprises. It allows the elderly to learn how to utilize information technology from the younger generations and apply it in their field of work, such as online marketing, new distributor sourcing, and resource management. The elderly, in return, exchange their agricultural wisdom with younger generations which enhances their role in the local communities.

4) Integrate socio-economic upgrading by sub-district and encourage technological skill application in daily life. One Tambon, One University Project is a good example of enabling the pre-elderly to increase their livelihood skills. Local educational institutions, such as Rajabhat University and Rajamangala Institute of Technology, are involved in developing and promoting the elderly's potential in integrated work. Each institution by expertise is responsible for a specific target audience and mission to avoid work duplication. The shortcomings were that the tasks were not purposeful, giving the operation an overall picture that only achieves quantitative success, lacks qualitative outcome, and inefficient use of budget.

5) Upskill funding. Source funding to upskill the elderly in the agricultural sector to increase production efficiency and promote the creation of agriculture-related supplementary occupations, such as value-added product

processing and agricultural tourist attraction areas. The special credit system, social enterprise system, and the creation of social responsibility (CSR) are recommended. An example is mentoring in the business sector or banks for an elderly enterprise group, such as One Company One Enterprise.

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