

FACTORS ASSOCIATED WITH STRESS LEVELS AMONG THAI FARMERS DURING THE COVID-19 PANDEMIC

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Abstract. The coronavirus disease-2019 (COVID-19) pandemic has resulted in increased stress levels among Thai farmers, which can negatively impact their physical and mental health. This study aimed to determine the factors associated with stress among farmers in order to inform efforts to support the mental health of this population. Study subjects were Thai farmers in Kanchanaburi Province, Thailand. Subjects were purposely selected from Thai farmers aged ≥ 20 years in the study province. The minimum number of subjects calculated to be needed for the study was 250. Study subjects were asked to complete a questionnaire that asked about demographics, work experience, the impact of COVID-19, their self-perceived stress levels, the presence of selected factors that could influence stress and a Thai version of the Job Content Questionnaire developed by Phakthongsuk and Apakupakul. The questionnaire results were interpreted using the Karasek Job Demand-Control model, which is a model used to identify workplace stressors. The questionnaire was scored with a total possible number of 0-241 points, where a score of 0-144 points was defined as having a low stress level and a score of ≥ 145 points was defined as having a high stress level. The study was conducted during June-September 2021. We used multivariable logistic regression analysis to identify factors significantly associated with a high stress level. A total of 144 subjects were included in the study; 59.7% male. The mean ($\pm$ standard deviation) age of subjects was 52.1 (± 12.9) (range: 22-65) years. 59.7% of subjects had low stress levels and 40.3% had high stress levels. On multivariate analysis the factors significantly associated with a high stress level were: lack of agricultural investment (the inadequate availability of agricultural funding) (adjusted odds ratio (aOR) = 8.94; 95% confidence interval (CI): 1.02-78.44; $p=0.04$)

and the impact of the COVID-19 pandemic on psychological stress (aOR = 3.20; 95% CI: 1.16-8.78; $p=0.03$). Factors not significantly associated with stress were: age, marital status and work experience. In summary, the factors associated with high stress levels among study subjects were lack of agricultural investment and impact of COVID-19. We conclude, a program to improve the mental health of the study population needs to deal with the problem of agricultural investment and the effect of COVID-19. Further studies are needed to determine if a program that addresses these issues can practically improve stress levels in the study population.

Keywords: Thai farmers, stress, agricultural investment, impact of COVID-19

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INTRODUCTION

The coronavirus disease-2019 (COVID-19) pandemic has caused unprecedented challenges and stress for people around the world, including farmers in Thailand. The results of a 2022 Gallup poll conducted world-wide regarding emotions found 41% of adults worldwide complained of having a lot of stress (Ray, 2022). A 2019 Cigna Well-Being Survey revealed Thailand ranked fifth highest in population stress levels among 23 countries surveyed, with 91% of Thai subjects stating they experienced stress (Cigna, 2019). Commonly reported causes of stress include socioeconomic problems, low income, chronic health problems,

an unsafe living or working environment and lack of social support (Allen *et al*, 2014; WHO, 2020). High levels of stress have been reported to have negative health consequences, such as development of depression, poor sleep, increased risk for infections, worsening of autoimmune diseases, development of stomach ulcers, development of coronary artery disease and development of some cancers (Wang *et al*, 2007; Scandalios, 2005; George and Jeffrey, 2019; Zafar *et al*, 2021).

Thai agriculture, particularly rice production, is a crucial sector for the economy, comprising a large portion of trade revenue (Office of Agricultural Economics, 2020;

Carneiro *et al*, 2017; Framke *et al*, 2020). Farmers are exposed to physical and mental health hazards, such as harsh weather and production uncertainties (Emeny *et al*, 2012). Additional hazards include long working hours and heavy workloads, which can negatively impact productivity and lead to a psychologically stressful work environment (Arphorn *et al*, 2021; Choochouy *et al* 2022). The COVID-19 pandemic added to stress levels among Thai farmers (Sapbamrer *et al*, 2022a). Therefore, it is important to understand stress levels and their associated factors in order to develop programs to reduce stress and its consequences in the Thai farming population.

MATERIALS AND METHODS

In this study we conducted a cross-sectional study among rice farmers aged ≥ 20 years in Kanchanaburi Province, Thailand. Kanchanaburi is known for rice production and in 2018 there were 27,484 registered households in this province (Department of Agricultural Extension, 2019). Subjects were purposely sampled from farmers who were members of the Farmers Council in Kanchanaburi. After obtaining written informed consent we asked each subject to complete a self-administered questionnaire. The minimum number of subjects

determined to be necessary for this study was 250. Study subjects were asked to complete a questionnaire asking about demographics, work experience, the impact of COVID-19, their self-perceived stress levels, agricultural conditions, the presence of selected factors that could influence stress and a Thai version (Phakthongsuk and Apakupakul, 2008) of the Job Content Questionnaire (TJCQ); the original version was developed by Karasek (Karasek, 1979). The questionnaire results were interpreted using the Karasek Job Demand-Control model which is a model to identify workplace stressors which covers psychological demand, decision latitude, supervisor support, coworker support, physical demand, job security and hazards at work (Karasek, 1979).

Each item is rated on a Likert scale. Stress levels are classified as being either low or high, using a scoring system developed by Bloom (Bloom *et al*, 1971). A total of 241 points are possible. A score of 0-144 points is defined as have a low stress level and a score of ≥ 145 points is defined as having a high stress level.

The questionnaire was evaluated by three specialists: a psychologist, an occupational health specialist and a nurse. The validity index for this questionnaire was determined to be

0.7. We pilot-tested the questionnaire on 30 farmers not included in the study and the Cronbach's alpha coefficient was 0.8.

The data were analyzed using the Statistical Package for Social Sciences (SPSS), version 18 (SPSS Inc, Chicago, IL). Descriptive statistics were used to determine frequencies of distribution, percentages, means and standard deviations. Associations between selected study factors and stress levels were evaluated using either a chi-square test or a Fisher's exact test. Factors with a p -value <0.25 on univariate analysis (Hosmer and Lemeshow, 2000) were included in multivariate analysis, which was conducted using binary logistic regression. We used adjusted odds ratios (aOR) with 95% confidence intervals (CI) to identify significant associations between selected factors and stress levels. The significance level was set at $p < 0.05$.

The study was conducted during June-September 2021 and the study protocol was approved by the Human Research Ethics Committee of Mahidol University (MUPH 2021-021).

RESULTS

A total of 144 subjects were included in the study; 86 males. The mean ($\pm$ standard deviation (SD)) age of subjects was 52.1 ($\pm$ 12.9) (range:

20-65) years (Table 1). 77.1% of subjects were married. 61.1% of subjects had completed only primary school, 20.1% had completed secondary school, 14.6% had a diploma or Bachelor's degree and 4.2% had no education. 59% of subjects had at least 10 years of work experience.

The overall mean ($\pm$ SD) stress level score among study subjects was 140.9 ($\pm$ 23.3) points. 59.7% of study subjects met the criteria for having a low stress level and 40.3% met the criteria for a high stress level (Table 2).

On univariate analysis, factors significantly associated with a high stress level were: being female (crude odds ratio (cOR) = 1.75; 95% CI: 0.89-3.44; $p=0.10$), having a body mass index (BMI) ≤ 18.49 kg/m² (cOR = 0.26; 95% CI: 0.03-2.30; $p=0.20$), having a secondary school education level (cOR = 0.22; 95% CI: 0.02-2.22; $p=0.19$), working 7 days a week (cOR = 0.53; 95% CI: 0.27-1.05; $p=0.07$), having a debt of $>10,000$ THB (cOR = 1.87; 95% CI: 0.80-4.42; $p=0.15$), the lack of agricultural investment (the inadequate availability of agricultural funding) (cOR = 10.15, 95% CI: 1.30-80.00; $p=0.01$); having insufficient knowledge about agriculture (cOR = 2.61; 95% CI: 0.60-11.38; $p=0.17$); owning a farm (cOR = infinity; $p=0.16$); having pestilence on the farm

Table 1
Demographic factors of study subjects (N = 144)

Factors	Frequency <i>n</i> (%)
Sex	
Male	86 (59.7)
Female	58 (40.3)
Age in years	
≤34	15 (10.4)
35-39	10 (6.9)
40-44	14 (9.7)
45-49	14 (9.7)
≥50	91 (63.2)
Body mass index in kg/m ²	
≤18.49 (underweight)	7 (4.9)
18.5-23.4 (normal)	64 (44.4)
23.5-28.4 (overweight)	57 (39.6)
≥28.5 (obese)	16 (11.1)
Marital status	
Single	23 (16.0)
Married	111 (77.1)
Divorced/separated	5 (3.5)
Education levels	
None	6 (4.2)
Primary school	88 (61.1)
Secondary school	29 (20.1)
Diploma/Bachelor's degree	21 (14.6)
Work experience in years	
<1	4 (2.8)
1-5	18 (12.5)
6-10	37 (25.7)
>10	85 (59.0)

kg/m²: kilograms per square meter; SD: standard deviation

Table 2

Stress levels among study subjects (N = 144)

Stress level	Frequencies <i>n</i> (%)
Low (score 0-144)	86 (59.7)
High (score ≥ 145)	54 (39.3)

Note: Stress levels are categorized based on the Thai Job Content Questionnaire. Scores of 0-144 indicate low stress, while scores ≥ 145 indicate high stress.

(cOR = 9.81; 95% CI: 1.15-83.77; $p=0.02$) and having mental stress due to the impact of the COVID-19 pandemic (effects on market demand and prices, health risks, and psychological stress) (cOR = 3.16; 95% CI: 1.27-7.88; $p=0.01$) (Table 3).

On multivariate logistic regression analysis, the factors significantly associated with a high stress level were lack of agricultural investment (aOR = 8.94; 95% CI: 1.02-78.44; $p=0.04$) and having mental stress due to the impact of the COVID-19 pandemic (aOR = 3.20; 95% CI: 1.16-8.78; $p=0.03$) (Table 4).

DISCUSSION

In our study, 40.3% of subjects had a high stress level, lower than the 50.3% reported by a previous study among farmers in northern Thailand (Sapbamrer *et al*, 2022a). The causes

of stress among Thai farmers have been previously reported to include: labor shortages due to the fear of infection, unavailability of storage, perishable goods, shortages of seeds and fertilizers, transportation difficulties and marketing problems (Chitra and Gopinath, 2021).

In our study, two factors were significantly associated with high stress levels among our study population: the lack of agricultural investment and the impact of the COVID-19 pandemic. The lack of agricultural investment meant insufficient investment in the agricultural sector.

Thai farmers need adequate funding to make the changes necessary to improve production and these sources of funding were limited during the pandemic (Bunthong, 2014). Ways to reduce stress in this

Table 3
Association of factors with stress level among study subjects on univariate analysis (N=144)

Factors	Stress level, n (%)		Univariate analysis	
	Low	High	cOR (95% CI)	p-value
Sex				
Male	46 (31.9)	23 (16.0)	1	
Female	40 (27.8)	35 (24.3)	1.75 (0.89-3.44)	0.10
Age group in years				
<40	15 (10.4)	10(6.9)	1	
≥40	71 (49.3)	48(33.3)	1.01 (0.42-2.45)	0.98
Body mass index in kg/m ²				
≤18.49 (underweight)	6 (4.2)	1(0.7)	0.026 (0.03-2.30)	0.20
18.5-23.4 (normal)	39 (27.1)	25(17.4)	1	
≥23.5 (overweight)	41 (29.9)	32 (23.4)	1.23 (0.62-2.41)	0.57
Marital status				
Single	12 (9.0)	11 (8.2)	1	
Married	69 (51.5)	42 (31.3)	0.66 (0.27-1.64)	0.30
Divorced/separated	5 (15.2)	5 (15.2)	1.10 (0.25-4.82)	0.60

Table 3 (cont)

Factors	Stress level, <i>n</i> (%)		Univariate analysis	
	Low	High	cOR (95% CI)	<i>p</i> -value
Education level				
None	5 (18.5)	1 (3.7)	0.22 (0.02-2.22)	0.19
Primary school	52 (47.7)	36 (33.0)	0.80 (0.30-2.00)	0.58
Secondary school	18 (36.0)	11 (22.0)	0.67 (0.22-2.10)	0.49
Diploma/Bachelor's degree	11 (22.0)	10 (20.0)	1	
Work experience in years				
≤5	13 (15.1)	9 (15.5)	1	
>5	73 (84.5)	49 (84.5)	0.97 (0.39-2.44)	0.95
Number of days worked per week				
<7	37 (43.0)	34 (58.6)	1	
7	49 (57.0)	24 (41.4)	0.53 (0.27-1.05)	0.07
Debt in THB				
<10,000	22 (15.3)	9 (6.3)	1	
≥10,000	64 (44.4)	49 (34.0)	1.87 (0.80-4.42)	0.15
Problems encountered during the past 5 years				
Labor				
No	16 (11.1)	11 (7.6)	1	
Yes	70 (48.6)	47 (32.6)	1.00 (0.42-2.30)	0.96

Table 3 (cont)

Factors	Stress level, <i>n</i> (%)		Univariate analysis	
	Low	High	cOR (95% CI)	<i>p</i> -value
Lack of agricultural investment				
No	13 (9.0)	1 (0.7)	1	
Yes	73 (50.7)	57 (39.6)	10.15 (1.30-80.0)	0.01
Marketing				
No	68 (47.2)	42 (29.2)	1	
Yes	18 (12.5)	16 (11.1)	1.44 (0.66-3.13)	0.36
Technology				
No	81 (56.3)	55 (38.2)	1	
Yes	5 (3.5)	3 (2.1)	0.88 (0.20-3.90)	0.59
Production factors				
No	15 (10.4)	14 (9.7)	1	
Yes	71 (49.3)	44 (30.6)	0.66 (0.30-1.51)	0.33
Insufficient knowledge about agriculture				
No	83 (57.6)	53 (36.8)	1	
Yes	3 (2.1)	5 (3.5)	2.61 (0.60-11.38)	0.17
Owning a farm				
No	86 (59.7)	56 (38.9)	-	0.16
Yes	0 (0.0)	2 (1.4)	1	

Table 3 (cont)

Factors	Stress level, <i>n</i> (%)		Univariate analysis	
	Low	High	cOR (95% CI)	<i>p</i> -value
Pestilence				
No	85 (59.0)	52 (36.1)	1	
Yes	1 (0.7)	6 (4.2)	9.81 (1.15-83.77)	0.02
National disaster such as flood and drought				
No	62 (43.1)	37 (25.7)	1	
Yes	24 (16.7)	21 (14.6)	1.47 (0.72-3.00)	0.30
Impact from COVID-19				
No	26 (18.1)	7 (4.9)	1	
Yes	60 (41.7)	51 (35.4)	3.16 (1.27-7.88)	0.01

Note: Stress levels are categorized based on the Thai Job Content Questionnaire. Scores of 0-144 indicate low stress, while scores ≥ 145 indicate high stress.

CI: confidence interval; cOR: crude odds ratio; COVID-19: Coronavirus disease 2019; kg/m²: kilogram per square meter; THB: Thai Baht

Table 4
Factors associated with stress levels among study subjects on multivariate analysis (N=144)

Factor	aOR (95% CI)	<i>p</i> -value
Sex		
Male	1	
Female	1.54 (0.71-3.34)	0.28
Body mass index in kg/m ²		
≤18.49 (underweight)	0.29 (0.03-2.93)	0.29
18.5-23.4 (normal)	1	
≥23.5 (Overweight)	1.73 (0.77-3.91)	0.19
Education level		
None	0.55 (0.03-5.96)	0.45
Primary school	1.00 (0.31-2.91)	0.93
Secondary school	0.69 (0.18-2.59)	0.58
Diploma/Bachelor's degree	1	
Number of days working per week		
<7	1	
7	0.49 (0.22-1.13)	0.10
Debt in THB		
<10,000	1	
≥10,000	2.46 (0.88-6.92)	0.88
Problems encountered during the past 5 years		
Lack of agricultural investment		
No	1	
Yes	8.94 (1.02-78.44)	0.04
Insufficient knowledge about agriculture		
No	1	
Yes	1.03 (0.16-6.84)	0.98

Table 4 (cont)

Factor	aOR (95% CI)	p-value
Owning a farm		
No	-	
Yes	1	0.99
Pestilence		
No	1	
Yes	10.74 (0.91-126.87)	0.06
Impact of COVID-19		
No	1	
Yes	3.20 (1.16-8.78)	0.02

aOR: adjusted odds ratio; CI: confidence interval; COVID-19: Coronavirus disease 2019; kg/m²: kilogram per square meter; THB: Thai Baht

study population might include improving sources of credit for the farmers to enable them to improve production efficiency through better agriculture education about land allocation, improved irrigation, drought prevention systems and being able to purchase agriculture equipment jointly. This credit access can lead to changes in households and communities, reducing the risk for high stress levels (Promjeen and Limsoomboonchai, 2015).

The impact of COVID-19 refers to the effects of the COVID-19 pandemic, such as changes in market demand and prices, health risks, and psychological stress related to the

pandemic. The COVID-19 pandemic was significantly associated with high stress levels among our study subjects. One reason for this is market disruptions, resulting in reduced demand for agricultural products and subsequently lower prices, leaving farmers struggling to meet their financial obligations (Aday and Aday, 2020). Other factors include lockdowns and travel restrictions, resulting in inability to get product to market. Another factor was the shortage of migrant laborers essential to farm operations. This was due to border closures and travel restrictions (Timilsina *et al*, 2022; Štreimikienė *et al*, 2022; Sapbamrer *et al*, 2022b).

Another source of stress among Thai farmers having to do with the pandemic was concern about their own health and that of their families and communities (FAO, 2020).

This study had strengths such as the use of the Karasek Job Demand-Control model and examining the link between insufficient agricultural investment and farmer stress levels. However, giving credit results in debt, which may also increase stress levels. Weaknesses of the study included reliance on self-reported data, lack of information about other potential stressors, no mental health history data, and no comparison group of non-farmers. Another weakness is that we were not able to interview the minimum calculated number of subjects needed for the study, we interviewed 144 subjects instead of the minimum number needed of 250, which could underestimate factors significantly associated with stress.

In summary, about 40% of our study subjects had high levels of stress. The factors significantly associated with high stress levels were lack of agricultural investment and impact of COVID-19. We conclude that a program to reduce stress levels in the study population must include making credit available to study subjects, providing adequate

pandemic preventive and treatment measures to the study population and insuring consistent, adequate access to markets for produced products by the study population. Further studies are needed to determine if provision of these measures will result in a reduction of the prevalence of high stress levels in the study population.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare that they have no conflicts of interest.

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