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Influence of psychological factors on climate change perceptions held by local farmers in the northeast of Thailand

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Abstract

Global climate change is considered one of the most critical socio-ecological challenges of the 21st century. In recent years extreme weather events have increased significantly in Thailand as in other parts of the world. In most cases, climatic variability has always been associated with its implications for agriculture. To date, however, there has been inconclusive understanding of farmers' capacity to detect climate change and its potential impact. This study therefore explores how Thai farmers perceive global climate change and, further, to examine the influence of psychological factors on these perceptions. The study used mixed research methods, with both qualitative and quantitative approaches. Questionnaires were distributed to 70 randomly-selected agricultural households in Village 4 of the Nongbuasala sub-district, Nakhon Ratchasima, Thailand. The survey results indicated that the majority of respondents view climate change in terms of extreme high temperatures and flooding. Regression analysis also revealed positive correlations between perceptions of climate change and six psychological variables of awareness in general and mitigation, belief in the reality of climate change and human causes, feelings of worry, and self-efficacy ($.201 \leq r \leq .592$; $p \leq 0.05$). Conversely, in terms of perceived barriers, three components of cognitive dissonance (r = -.831), belief in limitation of lifestyle changes (r = -.305) and fear (r = -.283) were found to be negatively correlated with climate change perceptions by Thai farmers. Recommendations to deal with those perceived barriers are also discussed.

Keywords: Farmer; climate change; perception; psychological factors; Thailand

Introduction

Agriculture and climate change

Mounting evidence indicates that human-induced climate change is increasing the frequency and severity of extreme weather events, including tropical storms, droughts and floods [1]. Inevitably, the changing climate will carry significant impacts on multiple sectors, especially agriculture [2]. For example, erratic weather patterns, unpredictable rainfall and hot dry spells represent major limiting factors in sustaining agricultural productivity. Meanwhile, however, agriculture also makes a significant contribution to climate change, and was estimated to account for about 10-12% of total anthropogenic greenhouse gas emissions in 2005 [3]. Specifically, from 1990 to 2005, global agricultural methane and nitrous oxide emissions have increased by almost 17%, a change occurring largely in the developing countries of the world (Figure 1).

In addition, agriculture is one of the most important economic sectors in Thailand as it provides food security and livelihoods [5]. Agriculture plays a crucial role in the country's development both as a source of economic growth and employment. However, in 2003, agriculture was directly responsible for 24% of national emissions [6].

However, despite the mounting body of evidence for climate change and its impacts over the past century, understanding of the phenomenon is still limited [7] and climate change research in the area of environmental sociology has been lacking. Particularly in Thailand, there have been few studies of local perceptions of climate change risk, especially in the context of agriculture. IPCC (2007) claimed [2] that to develop effective and appropriate solutions, there is an urgent need for further studies to determine the capability of farmers to detect climate change and undertake any necessary mitigation actions. Therefore, this study aims to study how a global phenomenon such as climate change is perceived by Thai local farmers and, further, to examine the influence of psychological factors on their perceptions of climate change.

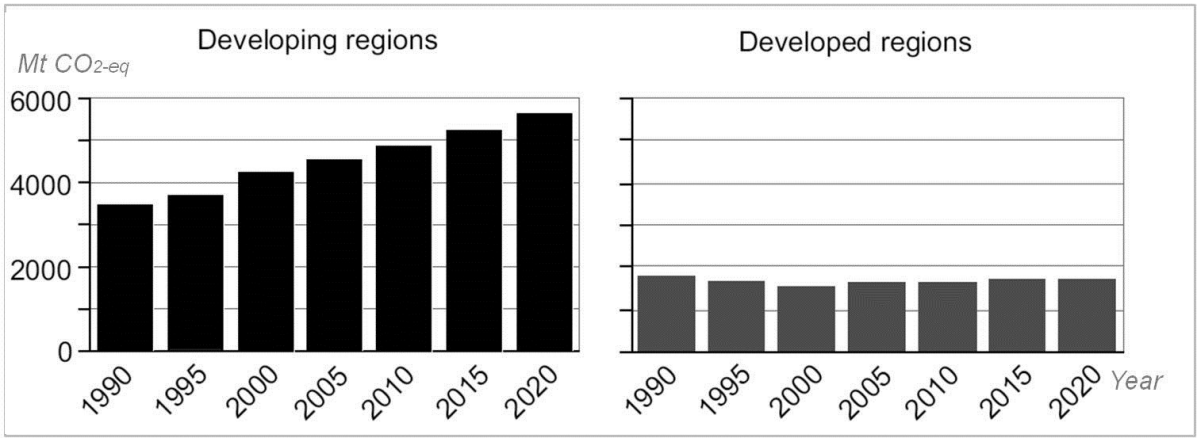

Figure 1 Estimated historical and projected GHG emissions in the agricultural sector from 1990-2020 (modified from [3,4])

Background and literature review: psychology and climate change

Public understanding of global climate change is influenced not only by technical descriptions but by psychological factors that also affect the willingness of people to acknowledge the reality of the problem [8]. As a discipline, psychology focuses on the role of affect in shaping perception, cognition and behaviour of the individual. [9] articulated that judgments about environmental risks and climate change are a function of an individual's beliefs and attitudes toward

the occurrence of such phenomena. However, faced with the complexity of climate change and its variability, many people stop paying attention when they realize that no easy solution is at hand. Added to this, a range of negative emotions such as feelings of helplessness, powerlessness, fear, worry and anxiety are considered as perceived barriers to individual voluntary actions to address climate change impacts [10].

1) Bloom's taxonomy of learning domains

To determine the complexity of human knowledge acquisition processes, Bloom et al. (1956) developed a three-part model known as the Taxonomy of Learning Domains [11] with the following categories:

• Cognitive domain: intellectual capability (i.e., knowledge, or thoughts)
• Affective domain: growth in feelings and emotion areas (i.e., attitude, or feelings)
• Psychomotor domain: manual and physical skills (i.e., skills, or doing)

For climate change, the various kinds of perceptual and behavioral gap are shown in Figure 2 [12].

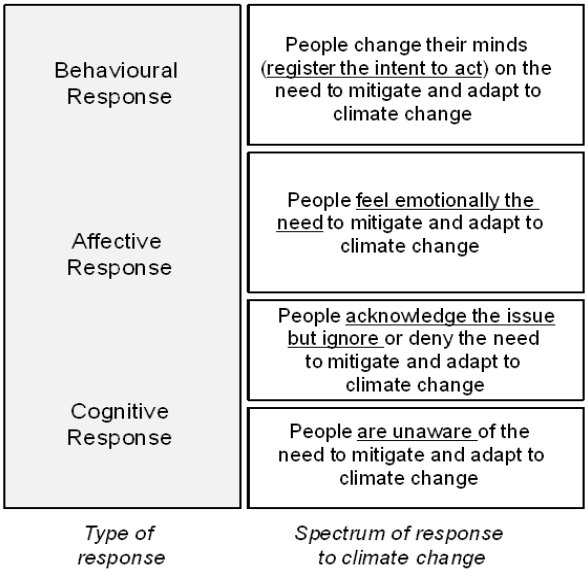

Figure 2 Perceptual or behavioral gaps on climate change (modified from [12])

2) Perception process

Perception refers to the range of mental processes of organizing, categorizing and interpreting information received via our senses. [13] articulated that sensations are the first states in the functioning of senses to represent stimuli from the surroundings, and perception is a higher brain function for interpreting events, objects and perspectives in the real world. Judgments about climate change are a function of people's beliefs related to the occurrence of such phenomena, attitudes towards its mechanisms and the degree of certainty with which their affect can be held [14]. In a sense, the topic of climate change is certainly complicated by the prevalence of scientific controversies, uncertainties and indeterminacies, so few laypeople fully understand the complexity and probabilistic processes of climate change and its potential impacts.

3) Emotional states

Some negative emotions can be regarded as strong predictors of climate change risk perception and the possibility for behavioural change [7]. Böhm (2003) classified four types of specific emotions in the domain of environmental risk: 'prospective' (e.g., fear, worry), 'retrospective' (e.g., sympathy, sadness), 'ethics based self' (e.g., guilt), and 'other' (e.g., anger) [15]. In terms of global climate change, negative emotions of fear and worry were considered to be the most intense [7], while other emotions are often rated as low intensity. As such, there is growing 'worry' regarding the consequences of natural disasters from climatic change and its potential impacts that will be worse for the next generation. And usually people may block out or distance themselves from certain information to avoid the feeling of fear and to eliminate cognitive dissonance (i.e., uncomfortable feelings) when their actions are not in line with their cognitions [7, 16].

Within this, the author therefore hypothesizes that:

(a) People who held various negative feelings (e.g., fear and worry) are less likely to be aware of climate change issues.

(b) People who experienced cognitive dissonance are less likely to be aware of climate change issues.

Research methodology

1) Study area and target population

This research was conducted in Nakhon Ratchasima province, northeast Thailand in 2012, as depicted in Figure 3. Target respondents in this survey were local farmers living in Village 4 of the Nongbuasala sub-district (n = 70). A major reason for selecting this group was that this particular area has always been affected by variable climate, including rare extreme events such as floods and severe droughts. Since 2009, low-lying communities have been affected by continuous flooding. As a result, land use patterns have changed from rice paddy fields to water ponds. However, the basic concepts of climate change and related issues are not generally well understood [17]. In terms of the demographic profile, the majority of survey respondents were male (82%), with only 18% female respondents. The majority of the respondents were between 40 and 59 years of age (n = 44). Of the 70 respondents, most had a high school education (66%) and nearly one-quarter had no education (24%); only 3% of respondents had achieved a graduate level education.

2) Questionnaire and surveys

To begin, each farmer respondent was asked open-ended questions about the general concept of climate change, for instance, "*Are you aware of global climate change and/or any particular weather phenomenon?*" If the answer was yes, they were asked "*Could you please explain this issue in more detail?*" To this extent, the term 'perception' in this study was defined as an understanding of the basic concept of climate change (both general definition and primary cause of climate change). By using a Likert scale, a high level of perception refers to the recognition that i) a general definition of climate change is any long-term change in temperature and weather patterns over time, and ii) it is primarily caused by burning fossil fuels. The respondents were asked to add a Likert scale numerical rating, from 1 (strongly disagree) to 5 (strongly agree), that best expressed their opinion on each statement related to climate change (see appendix A).

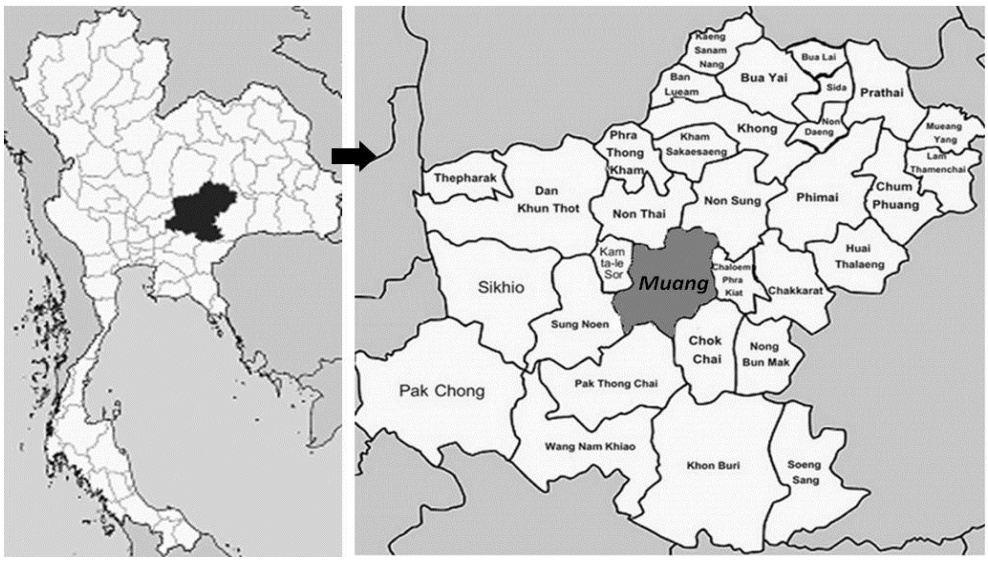

Figure 3 Study area: Muang district, Nakhon Ratchasima province, Thailand

3) Analysis

Descriptive statistics were firstly collated; correlation and regression analysis were then performed in order to examine the relationship between *dependent variables* (the perceptions of climate change by Thai local farmers) and the *independent variables* (psychological and related factors). As noted, all statistical analyses were computed using the Statistical Package for the Social Sciences (SPSS) for Windows version 17.00 at equal to (or less than) 0.05 significance level.

Results and discussion

1) Perception of climate change

According to the results of the agricultural household survey (n = 70), almost all respondents stated that they have no knowledge of how agricultural activities contribute to global climate change. Specifically, the vast majority of respondents view global climate change as a pattern of extreme high temperature (87%) and flooding (90%) rather than long-term changes in global temperature and shifts in climate patterns. One possible reason could be that most farmer respondents could not completely distinguish between '*climate*' and '*weather*'. As such, most of them only associate the phenomenon of climate change with extreme weather events in their community directly through their personal experiences.

The majority of farmer respondents, meanwhile, acknowledged that global climate change was primarily caused by deforestation (88%) and industrial emissions (55%) rather than the burning of fossil fuels (1%) and/or their own agricultural activities. The following interview results highlight the finding that local farmers have more difficulty understanding how their own agricultural practices contribute to global climate change:

"I have no idea at all about how I contribute to the global climate change problem"

"I know one thing that the weather is getting hotter and hotter"

"Probably lack of trees can lead to extremely hot dry weather"

"The problem may be occurring from air pollutants from industrial sources in my community"

"More importantly, I could not continue my cultivation due to floods and high water in the paddy field."

2) Psychological perspectives

From the psychological perspective, although almost all respondents believed that climate change is real (79%) and caused by human activities (92%), there remains a lack of awareness on climate change (27%) among Thai farmers. To exemplify this, almost all respondents held beliefs about the limitations of lifestyle change (99%) and had negative feelings of worry and fear (88% and 80% respectively), as illustrated in Figure 4. At this point, we suspect that the belief in fatalism (i.e. climate change is inevitable; even if we change, it is still going to happen) represents a potential barrier that may reduce the accuracy of respondents' perceptions and their proactive response to climate change problems.

3) Correlation analysis

Hypothesis 1 is supported by the data pattern in Table 1. Analysis of the results reveals that of the nine factors listed, six, namely awareness of climate change in general and mitigation, belief in the reality of climate change and human causes, feelings of worry, and self-efficacy, were found to be positively correlated with climate change perceptions. These scores ranged from $.201 \leq r \leq .592$; $p \leq 0.05$. In this context, awareness of climate change in general and feelings of worry had the strongest correlation with perceptions of climate change ($r = .592$ and $r = .404$, respec-tively). In contrast, a significant negative relationship was found between farmers' perception of climate change, cognitive dissonance

(r = -.831), belief in limitation of lifestyle changes (r = -.305), and the negative feeling of fear (r = -.283; $p \leq 0.05$). That is, if the respondents have a self-image of powerlessness, believing that they are not able to change anything and distancing themselves from certain information on climate change, then they are less likely to perceive and make sacri- fices to change their behavior in response to the problem.

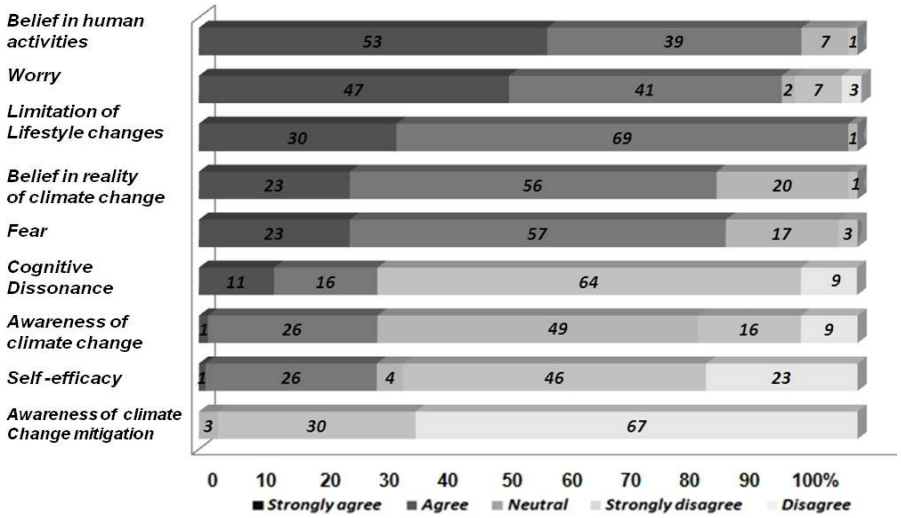

Figure 4 Beliefs related to climate change as a phenomenon among Thai farmers

Table 1 Correlation analysis between the agriculturist perceptions of climate change and related psychological and socio-cultural barriers (*p<0.05; **p<0.01)

Related barriers	1	2	3	4	5	6	7	8	9	10
1. Perceptions	1.00	.592*	.270	.201	.222	-.305*	-.283*	.404*	-.831**	.229
2. Awareness of climate change in general	--	1.00	.268	.364**	.260*	.127	-.243*	.396*	-.670**	.155
3. Awareness on climate change mitigation	--	--	1.00	.268*	..205	-.119	.074	.251*	-0.32**	.064
4. Belief in reality of climate change	--	--	--	1.00	.685*	.127	-.200	.207	-3.44**	.198
5. Belief in human causes	--	--	--	--	1.00	.105	-.087	.9297*	-.317**	.198
6. Limitation of lifestyles	--	--	--	--	--	1.00	-.165	.073	-.185	.171
7. Fear	--	--	--	--	--	--	1.00	.101	.402**	-
8. Worry	--	--	--	--	--	--	--	1.00	-.378**	.243
9. Cognitive dissonance	--	--	--	--	--	--	--	--	1.00	-
10. Self efficacy	--	--	--	--	--	--	--	--	--	1.00

From this standpoint, [12] indicates that climate risk perceptions are influenced by associate- and affect-driven processes rather than analytic processes. To some extent, the feeling of worry is an important psychological impact of climate change and can influence other parts of adaptation practice. These findings have led to the hypothesis that 'worry' over the possible consequences of climate change on agricultural productivity may lead farmers to perceive more and adapt to climate variability and change in particular. On the other hand, supporting the second hypothesis, the evidence from this study indicates that negative feelings of fear and cognitive dissonance can be considered as 'key perceived barriers' that may hinder the perception of climate change. The reason is that the majority of farmer respondents, especially those who believe they are at less risk compared to others, tend to externalize their personal responsibility

to the government and/or other related authorities (known as '*optimistic bias'* or '*un- real optimism*'). Furthermore, local farmers who fall into a state of attentional bias (that is, cognitive dissonance) are more likely to display negativity toward climate change for number of reasons, including the need for personal comfort, beliefs in technological solutions, and trust in their government. People are frequently found to believe they are at low personal risk from weather and climate hazards compared to others-a phenomenon [17]. In consequence, most of them tend to exhibit negative emotions associated with climate change (for example, helplessness and beliefs in the limitation of lifestyle changes) by avoiding thinking about the issues, shifting their attention and/or by focusing their awareness on positive self-representation.

4) Multiple regression analysis

As presented in Table 2, multiple regressions were separately computed for all six positively correlated factors to examine which ones could be used to predict respondents' perceptions. The results show that the regression model could explain 85.3% of the variance, F (6, 69) = 27.98, (p<0.0005). Among the six psychological factors, only the two components of belief in limitation of lifestyle changes and cognitive dissonance could significantly predict the perceptions of climate change held by Thai local farmers (p≤0.05). Again, belief in limitation of lifestyle changes was considered the most influential factor of all predictors (B = .163, t = 2.380, p≤0.05). They tend to avoid any in-depth discussions on climate change related topics in order to maintain desirable emotional states and also minimize their undesirable feelings.

5) Challenges and actions needed

This study has raised several issues concerning climate change perceptions; the findings lead to the following recommendations and directions for further research:

● The links between climate change and different types of extreme weather and climate events (e.g. drought and flooding) should be more effectively highlighted, especially in regard to the agricultural context.

Table 2 Summary of multiple regression analysis predicting the perceptions of climate change held by Thai farmer respondents

Predictor Variables	**B**	**Std. Error**	β	**t**	**Sig.**
Awareness of climate change in general	.117	.277	.038	.421	.675
Awareness of climate change mitigation	.058	.375	.011	.155	.877
Belief in limitation of lifestyle change	.928	.390	.163	2.380	**.020**
Fear	.194	.296	.051	.657	.513
Worry	.225	.213	.081	1.058	.294
Cognitive dissonance	-1.760	.233	-.762	-7.546	**.000**
R = .853 R^2=.727 SEE=1.514					

● Central government, educators and civil society should work to raise awareness and adopt policies on a range of climate change mitigation and adaptation strategies targetting the agricultural sector. One of the most effective strategies to manage negative emotions towards climate change is 'selective attention'. This technique is primarily aimed at coping with negative feelings of fear and helplessness. It can be used to shape thought processes through phasing out painful information about problems without a solution. Key stakeholders need to adopt a

multi-faceted approach which effectively combines a diversity of communication tactics, including the following: i) controlling exposure to climate change information, convincing citizens to stop thinking too far ahead, and iii) emphasizing possible practical actions to reduce the impact of climate change.

● Policy makers, communicators and related stakeholders should seek sustainable ways to minimize affective biases (e.g. cognitive dissonance and fatalistic thinking) and negative feelings of fear with regard to the topic of climate change. In addition, the way of integrating climate change into farmers' daily lives and their livelihoods must be more targeted.

● Local farmers who have experienced climate change-related problems in their lives should share their experiences directly with those who haven't in order to increase their perception and, hopefully, take voluntary mitigation action.

● Further research is needed to explore the gap between farmers' perceptions of climate change and their mitigation and adaptation actions. The influence of socio-cultural barriers in Thai local farmers' perception and engagement (e.g. through social structures, social norms, social risk perceptions, etc.) with climate change must be more focused.

Appendix A: Questionnaire

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
(1) Perception					
1.1 Definition *In my opinion, the definition of global climate change is:* - An occurrence of extremely high temperatures - Air pollution - Atmospheric ozone depletion - Natural disaster (i.e. heavy flooding) - All change in temperature and weather patterns over time	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
1.2 Its cause *Climate change is mainly caused by:* - Natural variation process - Industry - Deforestation - Open burning - Fossil fuel burning (i.e. oil, coal, gas)	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
(2) Awareness					
2.1 *Climate change in general* I have ever heard, read and/or seen anything about climate change and related issues	☐	☐	☐	☐	☐
2.2 *Climate change mitigation* I have ever heard, read and/or seen anything about how to mitigate the problems of climate change	☐	☐	☐	☐	☐
(3) Affective					
3.1 *Attitude/belief in reality* I believe that climate change is a real problem	☐	☐	☐	☐	☐
3.2 *Attitude/belief in human activities* I believe that *human activity* is a substantial cause of global climate change	☐	☐	☐	☐	☐
3.3 *Attitude/belief in limitation of lifestyle* It's hard for me to change any lifestyle (in responding to climate change problems)	☐	☐	☐	☐	☐

Appendix A: Questionnaire (*continued*)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(3) Affective (*continued*)					
3.4 *Emotion: fear* I actually *fear* the potential impacts of climate change	☐	☐	☐	☐	☐
3.5 *Emotion: worry* I am *really worried* about the climate change problems	☐	☐	☐	☐	☐
3.6 *Cognitive dissonance* I'm always feel uncomfortable when thinking about the topic of climate change	☐	☐	☐	☐	☐
3.7 *Self efficacy* I myself have the responsibility to take steps to deal with climate change	☐	☐	☐	☐	☐

Conclusions

The debate on climate change and its impacts on agriculture is crucial to the very survival of humanity. The problem is that farmers' understanding of climate change issues is still minimal. This paper reports on a study that aimed to understand the influence of psychological factors on Thai farmers' perceptions of global climate change. The survey results suggest that there is a need for a concerted effort to increase awareness of climate change adaptation and mitigation among Thai farmers, with an emphasis on its implications in their choice of farming activities, optimum timing and crop seed varieties. Besides, and perhaps more importantly, all stakeholders should seek a sustainable way to deal with affective biases (e.g. cognitive dissonance, belief in limitation of lifestyle changes) and negative feelings of fear towards the climate change topic. Thereby, further studies on the capability of farmers to detect climate change and undertake any necessary actions are urgently needed.

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