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Farmers' perceptions of impacts of climate variability on agriculture and adaptation strategies in Songkhla

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ABSTRACT

In the past decade, there have been signs of climate variability that might have already affected certain aspects of the Songkhla Lake basin. This research was conducted to 1) identify the key problems of climate variability on the agricultural activities of farmers, 2) assess farmers' perceptions of the negative impacts of climate variability on agricultural activities, and 3) propose a set of adaptation strategies for agricultural development in the Songkhla Lake basin. Data were collected using structured interviews from a total sample of 271 farmers selected using the purposive and snowball techniques. The arithmetic mean was applied for data analysis. It was found that the key problem of climate variability on the agricultural activities of farmers in the Songkhla Lake basin was a reduction in crop yields. Farmers involved in fruit production, and fisheries suffered the most negative impacts of climate variability. The negative impacts of climate variability on para-rubber production, rice production, and oil palm production were at a high level. Five adaptation strategies for agricultural development were identified: 1) enhancement of capacity in impact assessment, 2) prevention and avoidance of negative impacts, 3) mitigation of negative impacts, 4) reduction of loss from negative impacts, and 5) rehabilitation of devastated areas and other losses. Furthermore, relevant agencies should campaign to raise awareness and understanding by farmers in terms of climate variability.

Introduction

Climate variability has become a global concern since it can adversely affect elements of various systems and sectors that threaten human wellbeing. The fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2013) provided clear evidence of changes in climate due to human activities. Recently, climate variability has had obvious impacts on agriculture in many areas of Thailand, which tends to be prone to more severe natural disasters with a higher frequency, particularly in southern Thailand including the Songkhla Lake basin. There are increasing concerns about possible climate variability and its impacts on the Songkhla Lake basin. Major concerns relate to temperature increases, irregular rainfall patterns, abnormal tropical storms, and severe flooding which directly affect the phonological cycle, agricultural productivity, and pest and disease incidences (Solomon & Shugart,

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1993 quoted by Apiratikorn, Sdoodee, Lerslerwong, & Rongsawat, 2012).

Most agricultural production in Thailand relies on rainfed conditions. Economic crop production is inherently sensitive to climatic variability, and crop yields are predicted to decrease from the negative impacts of climate change (Marks, 2011). Craufurd and Wheeler (2009) reported that a key factor affecting the rate of plant development is temperature. Under warmer climate conditions, crop development stages shorten and this leads to a reduction in mean crop yields. Limsakul, Limjirakan, and Sriburi (2010) noted that fluctuations in rainfall have considerable agricultural impacts, especially in southern Thailand where the strong influence of the southwest monsoon often causes heavy rainfall events and severe flooding. Changes in rainfall will aggravate problems related to water resource management for farmers who use 70 percent of the country's water supply (Marks, 2011).

Proactive preparation with due understanding and adaptation capacity are considered vital to cope with possible climate extremes and their impacts. Furthermore, the proactive preparation regarding climate variability and adaptation has already been raised in international mandates which Thailand must plan for and abide by. Important international agreements are: 1) The Cancun Adaptation Framework, 2) The Strategic Plan for Biodiversity 2011 −2020 and the Aichi Biodiversity Targets, 3) The Ramsar Convention on Wetlands, and 4) The Convention Concerning the Protection of the World Cultural and Natural Heritage, all of which can be used to guide the preparation for part of the Songkhla Lake basin.

Climate variability is anticipated to significantly affect agriculture because crop production is highly influenced by climatic conditions (Attavanich & McCarl, 2014; Deschenes & Greenstone, 2007; McCarl, Villavicencio, & Wu, 2008). Moreover, Attavanich (2013) found climatic parameters, such as summer temperature and winter temperature statistically significantly affected farmland values. Individual farmers may adapt in different ways to climate variability based on their capability. This research attempted to: 1) identify the key problems of climate variability on the agricultural activities of farmers, 2) assess farmers' perceptions of the negative impacts of climate variability on agricultural activities, and 3) propose a set of adaptation strategies for agricultural development in the Songkhla Lake basin. The results aimed to identify needs in terms of adaptation; in addition, they would be of some use, particularly for farming communities and responsible authorities in the region in learning and preparing to adapt better to climate uncertainty and risks, related natural disasters, and their impacts.

Literature Review

Bio-Physical Characteristics of Songkhla Lake Basin

Faculty of Environmental Management, Prince of Songkla University (2015) states that the Songkhla Lake basin has been considered a unique ecosystem covering three provinces in southern Thailand, that is, the whole of Phatthalung province, twelve districts in Songkhla province, and parts of the Hua Sai and Cha Uat districts in Nakhon Si Thammarat province.

On the west is the north-south lying Ban That mountain range while in the south, the basin is bound to the San Kala Khiri mountain range. Both mountainous areas are still covered by natural rainforests forming a vital part of its riverine ecosystem though an increasing portion has been invaded continuously by para-rubber and other economic crops which have caused surface erosion and landslides along with sedimentation in the lagoon and surface waterways. Next to the hilly terrain is a large flood plain that surrounds the whole Songkhla lagoon, and is used mainly for agriculture and paddy rice. On the northeastern side of the basin, there is a large wetlands complex—the Tale Noi wildlife sanctuary and the Khuan Kreng peat swamp that are related to the Tale Noi fresh water lake ecosystem and the Pak Phanang river basin in Nakhon Si Thammarat province. Parts of these wetlands are, however, degrading and being invaded by oil palm plantation, while the basin's northeastern coastal zone on the Gulf of Thailand has recently suffered from coastal erosion.

The Songkhla lagoon itself, also known as the three-water ecosystem, has long been an important multi-functional reservoir acting as natural pool for fresh, brackish, and saline water, and as natural drainage that links the lagoon and the open sea. The lagoon is thus naturally endowed with rich bioresources and biodiversity of both fauna and flora.

Climate Variability and Its Impacts on Agricultural Activities

Ramamasy and Baas (2007) documented that climate variability refers to variations in the mean state and other climate statistics (such as standard deviations and the occurrence of extremes) on all temporal and spatial scales beyond those of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or from variations in natural or anthropogenic forces (external variability). Climate change refers to any change in climate over time, whether due to natural variability or anthropogenic forces.

Agriculture is potentially the most sensitive economic sector to climate variability. Changes in climate can have direct effects on crop yields and production costs, as well as indirect effects on relative crop prices (Attavanich, Rashford, Adams, & McCarl, 2014). In addition, Attavanich and McCarl (2014) found that average climate conditions and climate variability contributed in a statistically significant way to average crop yields and their variability. Some early researchers have addressed the negative impacts of changing climate on para-rubber production; for example, Kositsup, Kasemsap, Thaler, and Ameglio (2007) reported that temperatures above 38 °C affected the photosynthesis rate of para-rubber leaves; nonetheless, growth rates were reduced when the average temperature rose above 28 °C (Isarangkool Na Ayutthaya, Dongsansuk, Teapongsorut, & Nakdaeng, 2007) Jacob and Satheesh (2010 quoted by Sdoodee & Rongsawat, 2012) reported that climate change as a result of global warming could influence the growth and yield of para-rubber trees in various direct and indirect ways. Satheesh and Jacob (2011) showed that as both

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