

Climate Change and Effect on Rice Production in Thailand

Nguyen Thi Phuong
Center for Applied Economic Research,
Kasetsart University
Thailand

INTRODUCTION

Today, the threats and challenges of the environment operating on food production are not limited to each country or region but most often than not, manifest on a global scale. One of the major challenges of our times is climate change—the continuing increase in temperatures, extreme temperatures, droughts, and rainfall intensity.

An ADB Report in 2009 states that, “Climate change is likely to be one of the most significant development challenges confronting Southeast Asia in the 21st century. Comprising 11 independent countries geographically located along the continental arcs”, including: Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

Southeast Asia is also expected to be seriously affected by the adverse impacts of climate change. Since most of its economy relies on agriculture and natural resources as primary income, climate change has been and will continue to be a critical factor affecting productivity in the region (IPPC, 2007).

In the case of Thailand, climate change is considered a serious threat and challenge in the development of agriculture in Thailand, especially rice production because of the following:

First: Thailand is one of the developing countries in Southeast Asia where agriculture plays a crucial role. For example, in 2015, the agricultural sector employed about 13.63 million people, accounting for 38.87 million people of the Thai labor force (National Statistical Office Thailand 2015) and agricultural activities generate about \$US40 billion, which contributed 10% of its gross domestic production (Office of the National Economic and Social Development Board 2015). The country is the world’s largest exporter of rice, and is often called “the rice bowl of Asia”.

Second: Climate change drastically affected the world, and Thailand will likely be one of the most affected countries because its geographical location. It is a low lying country with its capital close to the ocean, making Thailand extremely vulnerable to the changing weather (Danny Mark, 2011).

Third: According to Attavanich, (2013) weather analyses reported that western, upper part of central, and the left part of northern regions are projected to be better off, while the southern, eastern regions and lower part of central, and right part of northern regions is projected to be worse off. Surat Thani, Chiang Mai, Chumphon, Rayong, Chachoengsao, Songkhla, Chanthaburi, Nakhon Si Thammarat, Trang, Suphanburi are the top 10 provinces adversely affected by climate change”.

Therefore, Thailand is one of the countries where that will face the strong effects climate change on rice production. This is especially true in the southern, eastern regions, lower part of central, and the right part of northern regions where the effects will be more seriously pronounced as compared with the other regions.

Climate change in Thailand

Over the past 150 years, the global average surface temperature has increased by 0.76°C (IPCC 2007). Global warming has caused greater climatic volatility—such as changes in precipitation patterns and increased frequency and intensity of extreme weather events—and has led to a rise in mean global sea levels.

For the past five decades in Thailand, temperature increased, ranging from 0.10–0.18°C per decade (Jesdapipat, 2008).

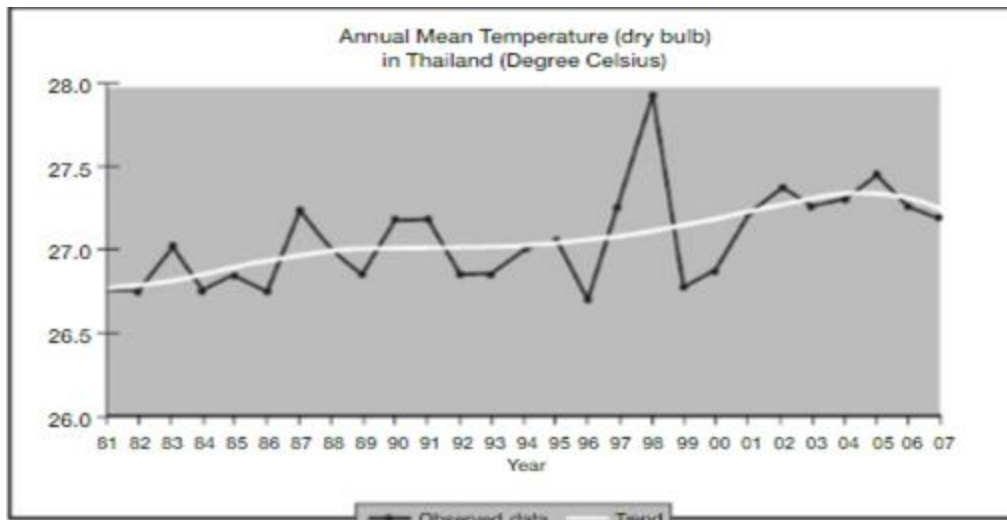


Fig. 1. Annual mean temperatures in Thailand

Source: Thailand’s Department of Meteorology, 2008

It can be seen that the annual mean temperature in Thailand rose by approximately 1°C from 1981 to 2007. The country has at some time in the past experienced an average daytime temperature of up to 40°C, especially during the month of April (Jesdapipat, 2008), and continued to rise up to 43.1 °C at 5, 2015 (Meteorological Development Bureau, 2016) while the number of rains per day decreased over the last years. In fact, between 1990 and 1993, rainfall was below normal levels, causing water shortages in 1993 (Fig. 2).

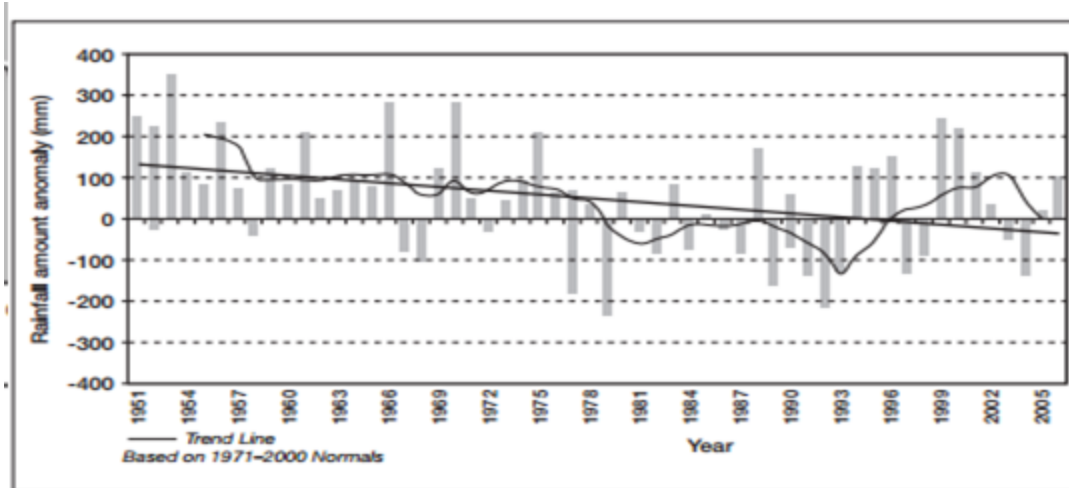


Fig. 2. Annual rainfall in Thailand

Source: Thailand’s Department of Meteorology, 2008

Plus, Graph 3 shows that, in most of the months of 2015, rainfall was lower than average. Especially, summer rainfall was below normal in most areas of Thailand. Annual rainfall averaged over the country at 1,419.6 mm. This was 168.1 mm (11%) below the 1981-2010 normal. May, 2015 was lowest, with monthly rainfall at 46 % below normal, the lowest recorded figure in the year (Meteorological Development Bureau, 2016).

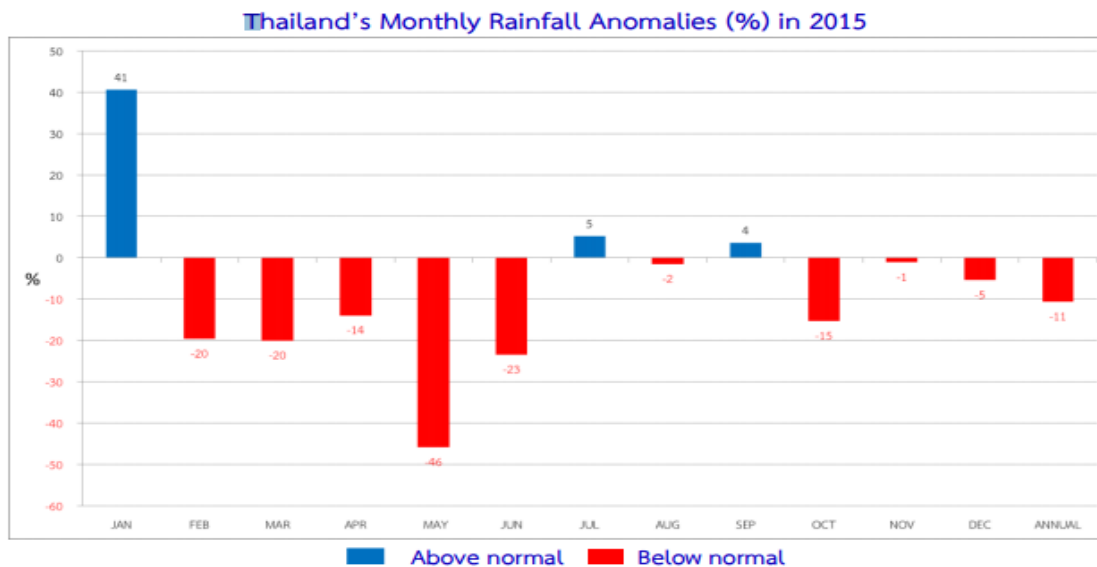


Fig. 3. Thailand’s monthly rainfall anomalies (%), 2015

Source: Thailand’s Department of Meteorology, 2016

Temperature increased while rainfall was below normal led to serious droughts that occurred over the years. For example: In 2005, 11 million people in 71 provinces were affected by water shortages (Corinne Kisner, 2008).

In 2008, the population suffered from severe drought. Again, over ten million people in the rural agricultural region were affected (Corinne Kisner, 2008).

In 2010, Thailand faced its worst drought in 20 years resulting in the drop of water levels in the Mekong River to fall at its lowest in 50 years. Villagers who lived along the river banks in Thailand, which is along the Mekong delta experienced drought. At some point, people were reportedly seen to be able to walk and cross the river, something which has never happened before (Danny Mark, 2011).

In 2015, majority of the areas in Thailand was much warmer and drier than usual. That was the second warmest year in Thailand on record for the past 65 years The first time was in 2010 (the warmest year was recorded in 1998). The mean temperature was above normal for all months especially December and November which was 2.1 and 1.9 °C above normal, respectively (Meteorological Development Bureau, 2016)

The increase in temperature led to rising of sea levels, which has risen approximately 12-22 cm over the last century, and as a low lying country with its capital close to the ocean, Thailand is extremely vulnerable to the changes in weather (Danny Mark, 2011). Areas along the Gulf of Thailand are likely to suffer periods of prolonged flooding because the tidal range is small and the natural water level is very low (IPPC, 2007).

Effect on Thailand's rice production

Effect on water resources in rice production

Thailand is an agricultural country that depends largely on natural water resources. However, effect of climate change on water resources is serious. As mentioned above, temperature increased while rainfall was below normal. This led to serious droughts that occurred over the years. Climate change had serious implications on its water resources (Boonprakrob, Hattirat, 2006).

Current rice production systems rely on ample water supply and are more vulnerable to drought stress. Drought is the most important limiting factor for rice production and is becoming an increasingly severe problem (Suzanne K. Redfern, Nadine Azzu and Jesie S. Binamira, 2012). Drought is the most serious constraint to rice production since most of the farmers' popular rice varieties are susceptible to drought stress (Serraj, 2009).

Thailand has 25 five watersheds which store and supply water for domestic, agricultural and industrial use as well as for regeneration of wildlife in natural ecosystems. However, changes in rainfall and temperature patterns and the frequency and intensity of rainfall due to climate change can affect the quantity and quality of water resources from the watershed areas down to the estuaries. Prolonged droughts and intense floods have frequently occurred, damaging vast tracts of agricultural areas and the commercial sector.

In 2010, due to drought, water levels in medium and large reservoirs sunk to 15 % of their total capacity (Danny Mark, 2011).

Climate change affects the balance of fresh water ecosystems, causing changes in biogeochemical and hydrological cycles (Boonprakrob, Hattirat, 2006). Saline intrusion from the sea has already contaminated some underground water sources (South East Asian, 2008).

Therefore, even though the country is one of the world’s largest rice producers and the largest rice exporter, its rice sector faces production constraints. And the major production constraints are rainfall variability and drought (IRRI's Rice Almanac, 2013).

According to Agence France-Presse, 2016: “Four consecutive years of below-average rainfall has drained water reserves and left irrigation channels in the heart of the country dry. Many rice farmers are currently unable to muster enough water to plant second crops, shaving their incomes and plunging many into debt. Thailand's prime minister told farmers to cultivate less rice to help the country manage its intensifying water crisis”.

Rain-fed rice plantations that were currently in season were now suffering the most from drought (Thaiturapaisan, 2015).

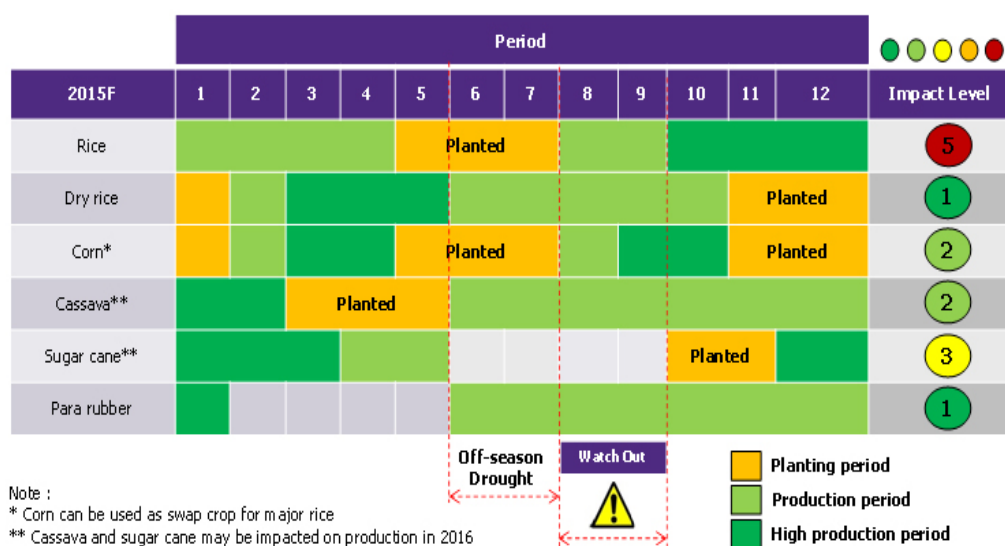


Fig. 4. Plantation and cultivation timeline for crops and different impact levels of the drought

Source: EIC analysis based on data from the Office of Agricultural Economics, 2015

Effect on rice’s areas planting in Thailand

Due to drought, farmers must delay the planting of rice because the water levels in medium to large size reservoirs nationwide are at 15 % of their total capacity (Suchaovanich, 2010). The drought has also damaged river-side farming practices, such as growing rice and vegetables used especially by ethnic minorities (Ellgee, 2010).

Now, the government issued three immediate measures to fight drought: 1) Delaying major rice planting to August and September, 2) Encouraging farmers to grow less water-intensive crops instead of rain-fed rice, and 3) Teaming up with the Bank of Agriculture to finance farmers who need to grow alternative crops (Thaiturapaisan, 2015).

Effect on areas and quantity of rice

Thailand exports food to the world market. The country is the top global rice exporter. Rice is not only a main product of Thailand but is also central to the culture of the Thai people. Rain-fed agriculture is a common practice among the rural Thai. Floods, heat waves and shortage of water as a result of climate change greatly diminishes agricultural production, which consequently affects social practices and the economic wellbeing of the majority of the people.

A report of Boonprakrob and Hattirat (2006) states that “From 2004 to 2005, Thailand was caught in the grip of a catastrophic drought. Thailand’s rice yield in 2005 “is expected to fall below 11 % to 14 % from last year’s harvests while sugar cane production is also expected to drop drastically.” One of the main causes of the current prolonged drought in Thailand can be attributed to global warming”.

According to Thailand's Disaster Prevention and Mitigation department, “55 of the country's 76 provinces have suffered, damaging over 150,000 rai (60,000 acres) of farmland, primarily rice paddies. The drought has contributed to concerns of a global food crisis and soaring grain prices at 2008.”

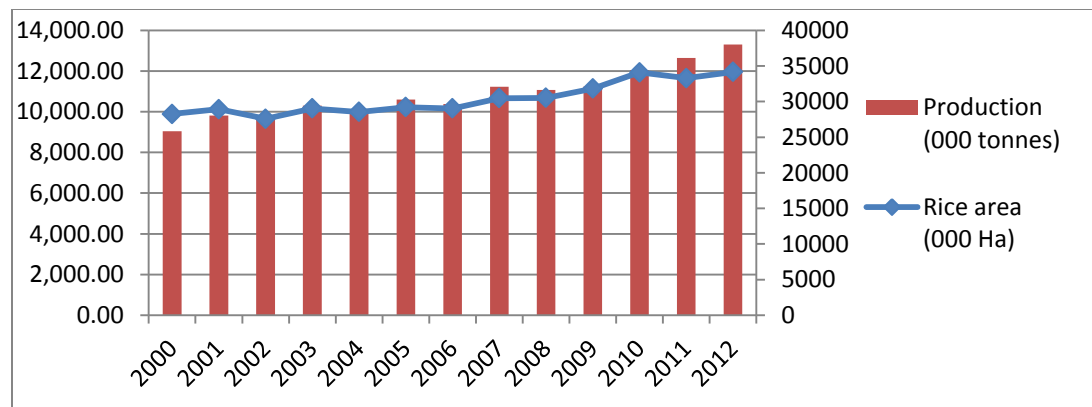


Fig. 5. Area and production of rice, 2000-2012

Source: faostat, 2016

The total number of area planted to rice decreased from 2010 to 2011, the time when the flooding phenomenon occurred in the country causing severe damages to agriculture.

Due to the drought of 2015-2016, Jeremy Luedi (2016) shows that rice’s quantity has declined 16 % from 19.8 million tons to 16.5 million, with 9 million set aside for export.

According to an ADB’ report, three countries will experience the biggest effect of climate change in Asia –Vietnam Thailand, and Indonesia. These countries are projected to experience a potential fall of about 50% in rice yield, assuming that there will be no adaptation and no technical improvement in 2100. The rice yield decline would range from 34% in Indonesia to 75% in the Philippines (ADB, 2009).

Effect on rice's export value due to low harvest

During the period 1991-2000, damage to agricultural areas caused by drought, floods and storms cost up to 50 billion Thai Baht. In 2004- 2005, the industrial estates of the eastern seaboard experienced severe shortage of water due to unprecedented prolonged drought.

The Asian Development Bank mentioned that the agricultural product export of Thailand was 13.3% of its GDP. The projected average real growth of Thailand's economy was 4.4% per year over the 10-year baseline, but this was interrupted from the historic flood that occurred during the last quarter of 2011. The loss of production throughout the duration of the floods led to interception of the global supply chain for Thailand agricultural products. The export values of rice and products in the last quarter of 2011 was less than that of the 2010 figure. Between 2010 and 2011 the value of rice production decreased from 21,486 to 13,328 million baht. (Aon Corporation, 2011).

Table 1. Quantity and rice export value of rice

(Unit : Millions of US Dollars)

Index	2012	2013	2014	2015
Rice export value	4632.27	4419.98	5438.69	4612.91
Quantity(Metric tons)	6,734,426.87	6,612,616.53	10,969,370.45	9,795,780.64

Source: Customs Department (Compiled by The Bank of Thailand), 2016

From the table above, production and rice export value fluctuated sharply and declined.

CONCLUSION

In general, climate change has become one of the global threats and challenges and the effects of climate change on agricultural production is increasingly serious. Thailand is one of the developing countries where agricultural sector plays an important role, especially in rice production.

Rice production in Thailand was affected severely by climate change. Rice production in this country is facing a drought, leading to a continuous decline in quantity and value of rice. The Thailand's government is calling to decrease the areas planted for rice, and delay the major rice planting season to August and September. The government is also encouraging farmers to grow less water-intensive crops instead of rain-fed rice. However, in the long term, the Thailand government and farmers need appropriate strategies and solutions to successfully face the effects and other challenges caused by climate change.

REFERENCES

- ADB (Asian Development Bank). 2009. The economics of climate change in Southeast Asia: a regional review. Manila http://www.climatechange-foodsecurity.org/uploads/ABD_ec_climate-change-se-asia.pdf,
- Agence France-Presse, 2016, Drought-stricken Thailand to cut rice production, <http://www.gmanetwork.com/news/story/556664/news/world/drought-stricken-thailand-to-cut-rice-production>,
- Alex Ellgee, "Mekong Drought Affects Shan Communities", The Irrawaddy, 17 March 2010,
- Aon Corporation. 2011 Thailand Floods Event Recap Report Impact Forecasting. Chicago; 2012, http://thoughtleadership.aonbenfield.com/Documents/20120314_impact_forecasting_thailand_flood_event_recap.pdf,
- Customs Department (Compiled by The Bank of Thailand), <http://www2.bot.or.th/statistics/ReportPage.aspx?reportID=748&language=eng>,
- Corinne Kisner, July 2008, Climate Change in Thailand: Impacts and Adaptation Strategies, <http://climate.org/archive/topics/international-action/thailand.htm>,
- IRRI's Rice Almanac, 2013, <http://ricepedia.org/thailand>,
- IPCC. 2007. Climate Change 2007: Impacts, Adaptation and Vulnerability. M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson, eds. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.
- Meteorological Development Bureau, Climatological Center, (2016), Annual Weather Summary over Thailand 2015 http://www.tmd.go.th/programs/uploads/yearlySummary/annual2015_e.pdf,
- Jeremy Luedi (2016) "Extreme drought threatens Thailand's political stability". Global Risk Insights. Retrieved 27 January 2016, <http://globalriskinsights.com/2016/01/extreme-drought-threatens-thailands-political-stability/>,
- Kinan Suchaovanich, "Drought threatens Thailand's rice crop", The Associated Press, 9 June 2010, <http://www.gmanetwork.com/news/story/193012/money/drought-threatens-thailand-s-rice-crop>
- Kansri Boonprakob, Ph.D. Sattara Hattirat April 2006, Climate and Thailand, <http://www.greenpeace.org/international/Global/international/planet-2/report/2006/7/crisis-or-opportunity-climate.pdf>,
- Teerayut Thaiturapaisan, 2015, Drought, a worrying situation for Thai agriculture, <https://www.scbeic.com/en/detail/product/1429>,
- South East Asian, 2008 "Climate Change Impacts in Krabi Province, Thailand: A study of environmental, social, and economic challenges" (Bangkok: South East Asian — Global Change System for Analysis, Research and Training, December 2009) http://startcc.iwlearn.org/doc/Doc_eng_11.pdf
- Redfern, Suzanne K., Nadine Azzu, and Jesie S. Binamira. "Rice in Southeast Asia: facing risks and vulnerabilities to respond to climate change." Build Resilience Adapt Climate Change Agri Sector 23 (2012), <http://www.fao.org/3/a-i3084e/i3084e18.pdf>

Witsanu Attavanich, 2013, “The Effect of Climate Change on Thailand's Agriculture”,
<https://www.researchgate.net/publication/262067789>.

Date submitted: Sept. 27, 2016

Reviewed, edited and uploaded: Oct. 4, 2016