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Vulnerability to climate change:
Adaptation strategies and layers of resilience

ADB

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Mainstreaming Grassroots Level Adaptation and Building Climate Resilient Agriculture in Thailand

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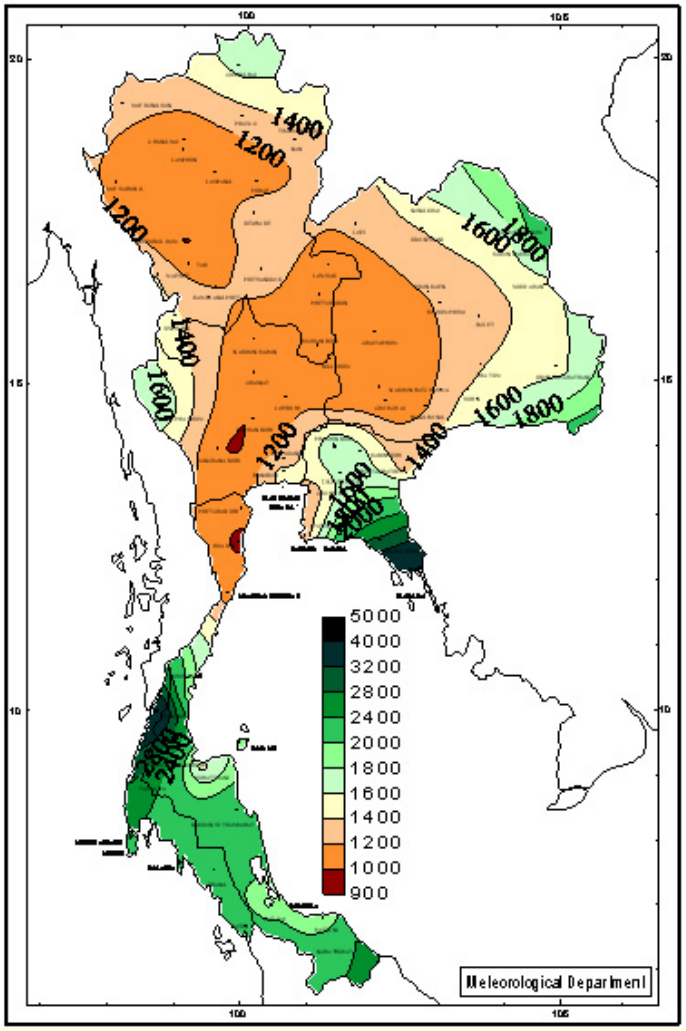
Background

Climate change is becoming severe and has had a negative impact on agriculture and farmers' livelihoods in Thailand. The climate change impacts on crop yield possibly leads to food insecurity globally. Scientists have projected a major climate change in the middle of the 21st century (2045-2065). The average monthly maximum temperature in Thailand is expected to increase by 3-4°C and monthly minimum temperature is expected to increase by more than 4°C throughout the country (Chinvanno 2010). The regions, ie, the Northeast, Central and the Northern, received less than 1,200 mm annual rainfall (1970-2005) and it is the driest area of the country. Agriculture in Thailand is already impacted by frequent drought or dry spells, flood, unpredictable rainfall and heat waves. Farmers have suffered from crop yield loss, diseases and insect pest damages, leading to household food and income insecurity. Migration for sustenance by finding another job is adapted as an alternative that they have chosen over the years. Farmers' have been adapting to climate risk continuously without sufficient awareness and support. Most farmers do not prepare to adapt against future climatic risk due to lack of climate related agricultural knowledge and access to essential information and resources. There is a greater need to understand the existing climate variability/change and farmers' perception on the changes in climate, impacts, adaptation, social and economic factors to find the best options in adaptation measures. Natural resource conservation, land use, water resource conservation, agricultural inputs and sustainable agriculture are also essential parts of the alleviation. To increase the level of understanding, a study was conducted by Field Crop Research Institute (FCRI), Department of Agriculture, Thailand in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), funded by the Asian Development Bank (ADB) through the project, "Vulnerability to

Rainfall Zonation of Thailand



Climate Change: Adaptation Strategies and Layers of Resilience", in collaboration with 7 countries in Asia – India, Bangladesh, Pakistan Sri Lanka, People's Republic of China, Thailand and Vietnam. The project aimed at contributing to policy issues for climate resilient agriculture and empowering farmers to go through challenges in the future, which might be more severe.

How has the Thai Government prepared for climate change?

The Thai government is aware of the climate change impact on agriculture since 2007. They have been creating platforms to improve awareness on declining agricultural production due to pest risks under climate change scenarios, managing CO_2 emission reduction and using biofuel in the Thailand National Economic and Social Development (NESDB) Plan 10 (2007-2011). The draft of the NESDB Plan 11 (2012-2016) had mentioned the risk of climate change to economical development (NESDB 2010). The Ministry of Natural Resource and Environment (MNRE) is also implementing about 15 Clean Development Mechanism (CDM) projects of the Ministry of Natural Resource and Environment (MNRE).

In 2008, Office of the Policy and Natural Resources and Environment Plan (MNRE), reported impact of global warming on reducing plant growth and subsequently yield. A prolonged drought increases the risk caused by insect damage, water shortage, etc. Six Strategies on "Climate Change" were set up:

- Adaptation to reduce vulnerability to climate change
- Reduction of GHG emissions and increased carbon sequestration/absorption
- Research & Development in understanding climate change to assess and initiate choices for adaptation to natural disasters
- Public awareness and peoples' participatory activities in communities
- Increased linkage of farmers/organization/researchers regarding the knowledge and research on Climate Change
- Develop framework for international cooperation, ie, G-77, APEC and ASEAN

The Ministry of Agriculture and Cooperatives (MOAC) set up a committee to plan the project on CO_2 emission reduction and contributed 4 policies to combat climate change:

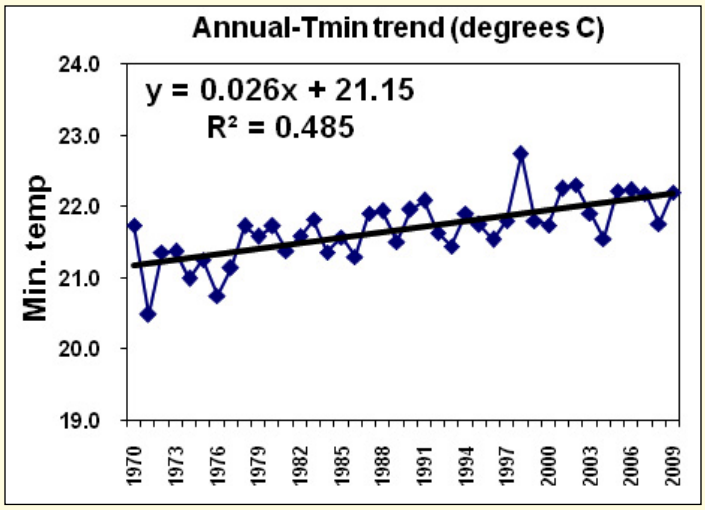
- Protect from natural disasters such as drought, flooding, etc; and set up a central unit for pre-warning/alarm system and planning of efficient utilization of natural/underground water.
- Support farmers in affected areas especially hit by natural disasters by providing food/basic support.
- Enhance country's food security by producing in high potential areas with appropriate supplemental irrigation system.
- Provide occupation and livelihood resilience after disaster by supplying basic needs such as crop seed, livestock for production (Iamnor 2009).

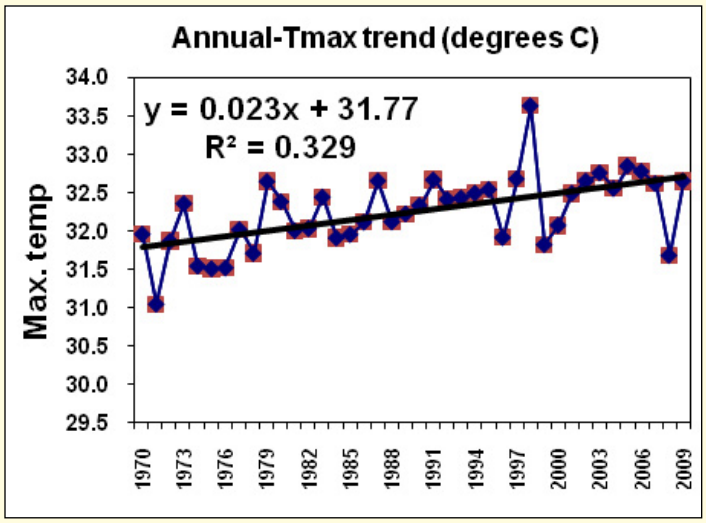
Climatic trends in Northeast Thailand

The Northeast was selected to be the target area for climate change study as it was one of the regions most vulnerable to drought in the country, together with few natural resources available, many smallholder farmers and low soil fertility. From the long term climatic analysis, it was observed that there was a slight change in the amount of annual rainfall and the number of rainy days in the area during the past 40 years (1970-2009); and there was an increasing trend in the summer season (February-April). This season starts just before the usual onset of monsoons (15 May) and farmers start land preparation for early rain cropping, ie, early rain cassava. If rainfall is not too heavy, this will be a good opportunity to start cultivating early and avoid climate variability during the harvest time. In contrast, if this is the harvest time for the dry season crops, there will be a risk of yield drop if there is a heavy rainfall during harvesting time leading to crop damage. Rise in temperature was also observed in both maximum and minimum temperatures in the country, region and study sites (Figure 1). Even though no significant trend in rainfall quantum was observed, its variation has been perceived by farmers during the cropping season and they still remember the drought events and flash floods they suffered from when they lost their crops.

Vulnerability to climate change in the Northeast

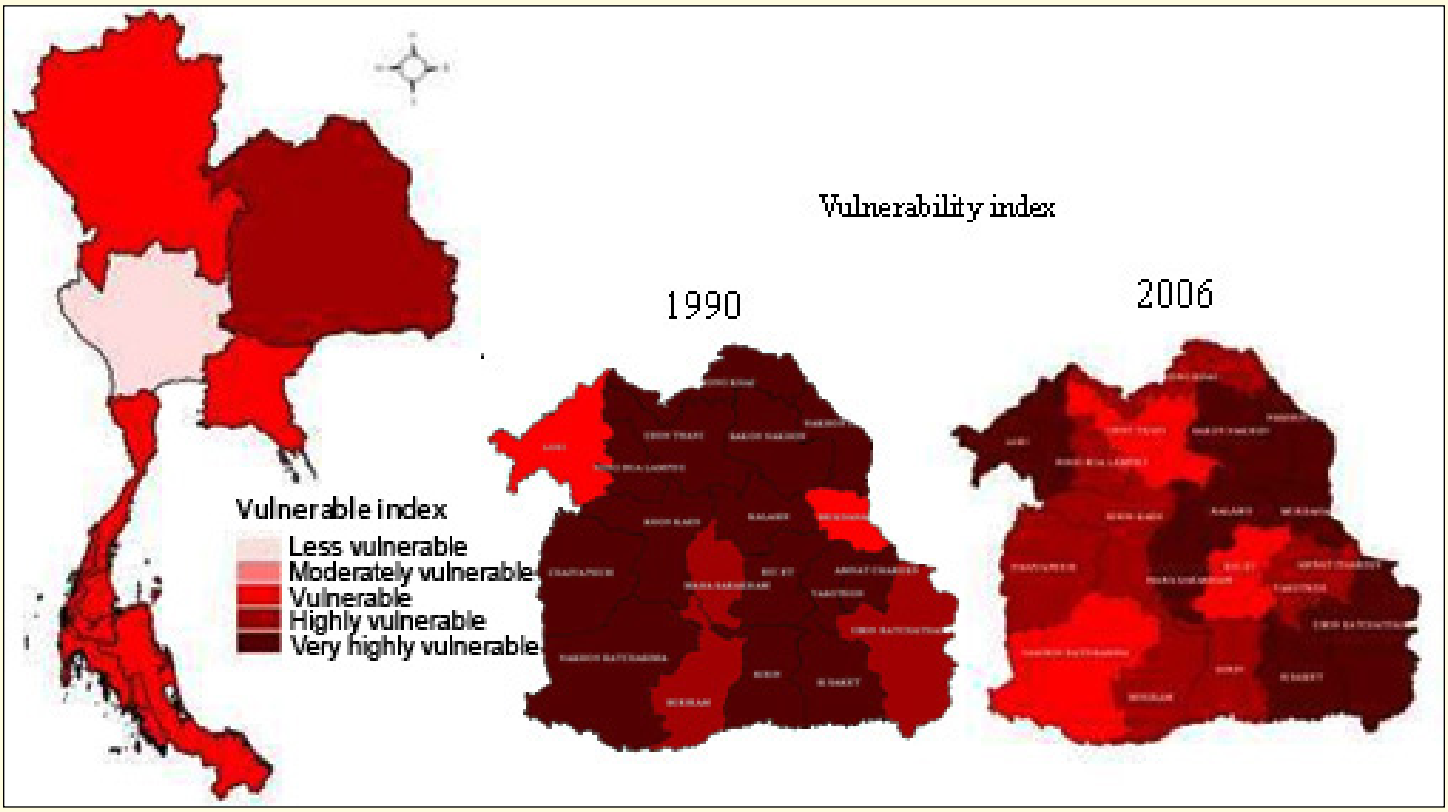
Vulnerability is the degree to which a system is susceptible to adverse effects of climate variability and extremes. Vulnerability analysis revealed that the northeastern region was the most vulnerable area to climate change (Figure 2). Provincial breakdown showed that the most vulnerable area was in the





Source: ICRISAT (a).

Figure 1. The Northeast region annual minimum and maximum temperature trends (1970-2009).



Source: ICRISAT (c).

Figure 2. Climate change vulnerability map of Northeast Thailand.

eastern provinces. It is changing over time due to the intervention and adaptation strategies used.

The decrease in vulnerability index of both target sites (Chatturat District, Chaiyaphum Province and Chok Chai District, Nakhon Ratchasima Province) from 1990 to 2006 implied the effective intervention and adaptation of the area. Secondary irrigation facilities, efficient fertilizer application, improved cropping intensity and effective crop production were the main factors identified in reducing the vulnerability to climate change. Analysis and lessons learnt from these selected areas would be useful for future policy formulation.

Adaptive capacities of farmers

After losing their crop production due to drought or flood conditions, farmers' adaptation was not only based on better agricultural practices but also better

living strategies, thereby ensuring sufficient income and food stuff (Table 1). Farmers' adaptive capacities are different based on the size of farm holdings or assets. Focused group discussions showed that it took 1-4 years to recover from the climate related shocks. Landless and smallholder farmers took the longest time in recovering from these extreme events.

Table 1. Time span to recover from climatic shocks (years).

Large farmers	1
Medium farmers	3
Small farmers	3-4
Landless farmers	could not estimate as they turned to non-farm occupations.

Source: ICRISAT (b).

What farmers perceive and how they get ready

Most farmers perceive that deforestation was one of the major causes of climate variability/change, coming out as unexpected drought and flood (ICRISAT b. In press). The farmers expressed that there was degradation in the amount and quality of common resources such as village pond, wells, river, pasture land and forest during the past 20 years. Bio-diversity, number of wild animals and plants, also decreased. The main crop production in the study sites consisted of rainfed and dry season rice and cassava, which can be grown throughout the year nowadays. Focus group discussions with landless, small, medium and large farm holders indicated that farmers suffered from frequent drought and the end of season's flash floods.

Adaptation was carried out in different categories: change in agricultural practices by delaying the sowing of crops with the onset of monsoon, changing planting methods from transplanting to broadcasting especially rice, introducing drought tolerant crop or variety, shifting cassava area to lower land, use of efficient irrigation systems, such as drip irrigation. Social adaptation was expressed by forming self-help groups in the village such as savings group, supplementary occupation group of basketry, One Tambon One Product (OTOP), a nationwide sustainable development initiative launched by the Thai government to help village communities to help each other. Economical adaptation was practiced by minimizing expenditures, getting credit support for buying essential food and agricultural activities, and shifting from agriculture to non-farm work. Many of them were supported by government programs, for example, irrigation system, village pond and other non-farm occupations. They had been adapting, from time to time, their existing knowledge to these changes from the past but they have now developed new adaptation strategies to combat these frequent and severe variations in climate. Farmers need to be prepared for coping with future risks and at the same time overcome constraints.

Perception factors affecting vulnerability index to climate change in the study villages

Increase vulnerability

- Drought perception
- Variation in onset and distribution of rainfall
- High temperature
- Irrigation change

Decrease vulnerability

- Household income
- Forest area
- Dry season crops.

Constraints preventing efficient adaptation?

Focused group discussions provided insights into the constraints of farmers in performing efficient adaptation. These points will lead to the country's policy environment building.

Farm level

- Capacity to diversify crop
- Access to information/knowledge
- Availability of efficient crop varieties

Institutional level

- Recommended adaptation strategies not within their priority needs, so adoption of new technology is harder
- Efficient governance
- Less understanding of climate change impacts

Technological level

- Climate smart technologies in agriculture: crop varieties, cropping pattern, agricultural practices, efficient water use and management

- Efficient water harvesting and storage, especially in farms

Social level

- Availability of labor
- Access to good leadership
- Equality in access to better facilities and information.

Source: ICRISAT (b).

Need to build grassroots resilience capacity – Policy Environment

Climate change is imminent and is expected to be more severe in the coming years; there is a threat to food security and further difficulty in living conditions. Agriculture as a food supplying sector should be sustained and farmers need to be prepared for it. Adaptation occurs at the local level and it has not been clear enough for other supporting sectors in the country in terms of action. Building capacity at various layers enables the rural community to adapt to climate variability and extremes, irrespective of their socio-economic strata. First, there should be a fine-tuning of the existing climate related policies and the delivery mechanisms of the existing developmental programs. Then, these policies should be integrated to cater to farmers' needs addressing different levels such as Farm, Social, Institutional and Technological levels. Future policy support should ensure equity and should mainstream into the general policy framework.

Policy Recommendations

- Introduce bottom up approach strategies at micro, meso and macro levels of the country or region that are based on local experience, knowledge and needs
- Provide institutional support for strengthening collective action and social capital
- Support programs or environment for non-farm income diversification
- Build short and long term warning systems for climate disasters
- Build capacity at different levels (policy maker, government machinery, scientists, extension personnel and farmers) to sensitize and smoothen the delivery pathway
- Invest in conservation systems for natural resources, water resources and for providing a system for efficient water harvesting and storage
- Invest in research, development and effective participatory extension system for climate smart agricultural technologies (soil improvement, water management for crops, efficient crop varieties and cropping pattern, weather and crop insurance)
- Invest in accessibility system to provide credit, market and knowledge for farmers
- Keep in mind a sufficiency economy approach for all activities (see overleaf).

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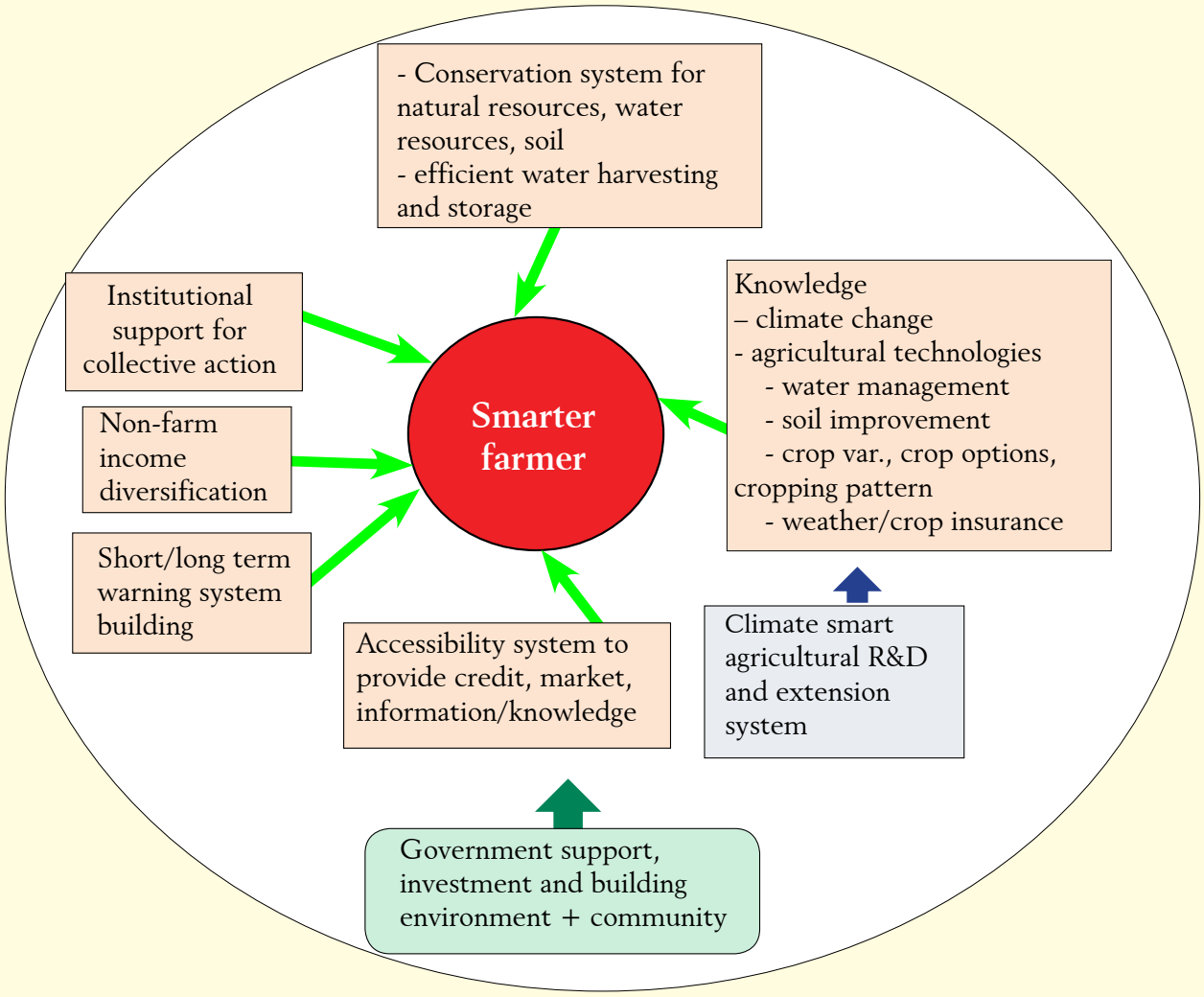
Sufficiency economy approach - Roadmap to climate smarter farmer



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