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Climate Change Adaptation Policy Guidelines for Agricultural Sector in Malaysia

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Abstract

Climate Projection shows the impacts of climate change on agricultural sustainability and relevant livelihood sustainability is vulnerable in Malaysia. Here mitigation is necessary but adapting to future risk is more important for immediate and long term action relating to the larger number of stakeholders in local scale. Generally adaptation policy has different levels and approaches that related with different challenges. Several countries have already prepared their adaptation approaches in their own way. Malaysia is on the way to develop its adaptation policy for last couple of years. This paper focuses on few guidelines that need to examine carefully while determining the climatic change adaptation approach for agricultural sector in Malaysia.

Introduction

The changing patterns of climate factors adversely affect the social, economical and environmental agents all over the world. The direct impacts of climate change include loss of life, destruction of resources, and vulnerability of livelihoods. The agricultural sector is fully sensitive towards the changes of climate factors. So, any little changes in climate factors adversely affect agricultural production as well as relevant stakeholders.

According to FAO (2003) agriculture accounts for 24% of world output that uses 40% of total land area. Among all agriculture output, rice, wheat and maize make up 85% of world cereal exports which are the main sensitive crops to climate change. Under current climate change scenario, temperature above 25°C may decline grain mass of 4.4% per 1°C rise (Tashiro and Wardlaw, 1989), and grain yield may decline as much as 9.6%-10.0% per 1°C rise (Baker and Allen, 1993). But the average temperature of rice growing areas in Malaysia is about 26°C. Singh et al. (1996) mentioned that the actual farm yields of rice in Malaysia vary from 3-5 tons per hectare, where potential yield is 7.2 tons. It also mentioned that a decline of rice yield between 4.6%-6.1% per 1°C temperature increase under the present CO₂ level. Alam et al. (2009) mentioned that total yearly rainfall in Malaysia is increasing but its monthly variation is too high. In Malaysia, the effect of lower rainfall is almost possible to check through proper irrigation system, but the opposite phenomenon of over rainfall for any particular time, especially at the end of the crop cycle or at the maturity period, causes serious damages of crops, which is absolutely uncontrollable now.

Due to high greenhouse gas emissions, the temperature is projected to rise by 0.3°C to 4.5°C in Malaysia. Warmer temperature will cause to a rise in sea level about 95cm over

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hundred-year period. The changes in rainfall may fluctuate from about -30% to +30%. This change will reduce crop yield and prone to drought in many areas so that cultivation of some crops such as rubber, oil palm and cocoa will not possible (NRS, 2001).

NRS (2001) projection shows more than 0.4% changes of rainfall by 2020 and 1% by 2060 will cause to decline the earning of farmers under a certain level of temperature. Moreover, NAHRIM (2006) projection shows maximum monthly precipitation will increases up to 51% over Pahang, Kelantan and Terengganu, while minimum precipitation decrease between 32% to 61% for all over Peninsular Malaysia. At the same time, annual rainfall will increase up to 10% in Kelantan, Terengganu, Pahang and North West Coast, and decrease up to 5% in Selangor and Johor by 2050. This variation of climate factors will cause the agricultural system vulnerable in Malaysia. As poor people are mostly engaged in agricultural activities, the poverty rate will increase more in the agriculture sector based on the projected variation of rainfall and temperature. Moreover, climate change will likely to exacerbate inequalities due to the uneven distribution of the burden of damage, and remedy actions. Under these circumstances, adaptation policy is very crucial for the agricultural sustainability as well as the livelihood sustainability in Malaysia. This paper is an attempt to provide some essential issues that need to examine carefully while determining the climatic change adaptation approach for agricultural sector in Malaysia.

Levels and Approaches of Adaptation for Malaysia

Adaptation is not a substitute of mitigation, but there are arguments for adaptation to consider as a response measure. Mitigation actions never stop a certain degree of climate change due to historical emissions and the inertia of the climate system (IPCC 2001). Moreover, mitigation effects may take several decades to manifest, where most adaptation activities take immediate effect. Adaptation reduces risks associated with current climate variability as well as addressing the risks associated with future climate changes, where mitigation only focuses in future risks. The measures of adaptation can be applied on a local scale or root level with the involvement of large number of stakeholders, where mitigation works in the decision making level. In the current world, climate factors are exogenous variable that immitigable in a quick manner as a consequence adaptation is the most appropriate way to cope the system properly.

Different approached has been taken by different countries to adopt with climate changes. Nepal takes the approach of community based adaptation measures to weather related disasters, micro-finance mechanism through special insurance scheme to cope with increasing flash-flood, and adaptation through institutional arrangement. Mongolia takes the approach of policy framework for adaptation strategies for the Mongolian rangelands to climate change at multiple scales, and risk communication at multiple levels to build common awareness. India takes the approach of promoting integration of adaptation strategies into developmental policies by effectively communicating climate risks and adaptation measures. Philippines takes the approach of mainstreaming climate change adaptation in watershed management and upland farming. Bangladesh takes the approach of participatory climate risk assessment and development of local adaptation action plans, community-based practice to survive in changing ecosystem condition- permanent flood (water logging), and household level adaptation.

Malaysia is on the process of developing its policy for upcoming adverse negative climate impacts. It recognizes adaptation as an important component of policy response to climate change strategy (NRS, 2001), that has been reflected in the basic principles of Second National Communication to the UNFCCC Project (NC2) Malaysia : fit in with the nation's development priorities (poverty alleviation, food security enhancement, action plans under MEAs); to reverse trends that increase maladaptation and raise risks for human populations and natural systems; continuous reassessment of current plans for increasing the robustness of infrastructure designs and long term investments; improvement of societal awareness and preparedness for future climate change (policy makers to local communities); increase understanding of factors that enhance or threaten the adaptability of vulnerable populations and natural systems; create a focus towards assessing the flexibility and resilience of social and natural systems; ultimately rely on a thoughtful assessment involving a robust stakeholder process rather than being dependant on the availability of high quality data and extensive experience on computer based models.

While developing an approach of adaptation, Malaysia should carefully focuses on few issues. IPCC (2001) mentioned few issues while refers to adaptation assessment- "practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency and feasibility". Policy makers also need to focus on the determinants of adaptation capacity that has been suggested by Yohe (2001): the range of available technological options for adaptation; the availability of resources and their distribution across the population; the structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that would be employed; the stock of human capital, including education and personal security; the stock of social capital, including the definition of property rights; the system's access to risk-spreading processes, e.g., insurance; the ability of decision makers to manage information, the processes by which these decision-makers determine which information is credible and the credibility of the decision-makers, themselves, and the public's perceived attribution of the source of stress and the significance of exposure to its local manifestations.

Options of Adaptation for Malaysia

The options of adaptation depend on the local socio-economic-cultural-political perspectives. The adaptation should be taken in different stages – government, farm, and other relevant service providers' level. Smit and Skinner (2002) said adaptation approaches need to follow in the technological level, government level, and farm level. While defining the adaptation policy, Malaysia needs to consider following issues carefully.

Technological developments: The technological adaptation is practicing almost all developed counties. Several places it is sponsored by federal and provincial governments and found effective. The technological development needs to adapt in the following different ways:

- ***Resource management innovations:*** To address the risk of moisture deficiencies, increasing frequency of droughts, and improvement of irrigation, water management innovations needs to develop. Farm-level resource management innovations needs to develop to address the risk associated with changing temperature, moisture and other relevant climatic conditions.

- *Crop development:* To increase the tolerance and suitability of plants under different temperature, moisture and other unfavorable climatic conditions, crop variation, hybrids, new crops, and alternative crops development is very important.
- *Weather and climate information systems:* Weather forecast, early warning system and ensuring delivery of proper information to farm level is also very important.

Government programs: Government as the policy and law making authority has to play most influential role to ensure adaptation in all level. Government roles in adaptation approach can go in the following ways:

- *Agricultural subsidy and support programs:* Proper policy for financial support – subsidy, incentive, compensation, assistance - need to setup to influence farm-level production practices, risk management strategies, financial management, disasters or extreme events challenge, and ensure income stabilization programs.
- *Resource management programs:* Develop and implement policies to ensure proper utilization of the resources - water, land, infrastructure etc - time to time in the light of changing climate conditions.

Farm production practices: Farm production adaptations include farm-level decisions respect to farm production, land use, irrigation, and the timing of operations etc. Detail options are following:

- *Farm production:* Farm needs to change the intensification of production and diversify crop types and crop substitution to address the environmental variations and economic risks associated with climate change.
- *Land use:* Farms need to utilize land properly and change the location of crop production to address the environmental variations and economic risks associated with climate change.
- *Irrigation:* Farm needs to develop efficient irrigation practices to address the moisture deficiencies associated with climate change and reduce the risk of income loss due to recurring drought.
- *Timing of operations:* Farm needs to adopt with the changing duration of growing seasons and associated changes in temperature and moisture.

Farm financial management: Farm financial adaptation options include responses towards farm income and financial management strategies related to the risk of climate change that elaborate following options:

- *Crop shares and futures:* To reduce the risk of climate-related income loss, farm needs to take protection through crop sharing, and financial options such as hedging/ future option, insurance etc.
- *Income stabilization programs:* Farm needs to take income stabilization programs, such as portfolio of investment, saving scheme, minimum income protection by government or insurance etc, to reduce the risk of income loss due to changing climate conditions and variability.

Among all of these options, it is also important to project more accurate changes in climatic factors and level of effects of the changes. Ultimately, the adaptation will be highly depended on technology in long run, and financial protection in the short run. So, the full

adaptation policy should be flexible in respects of options and time. At the same time coordination among all the stakeholders also need to be prioritized.

Conclusion

Considering the discussion and the projection, the overall agriculture and relative livelihood in Malaysia will become vulnerable as well as their socioeconomic development and sustainability will be hampered due to the climatic changes. In recent years, adaptation has gained prominence as an important response measure, especially for vulnerable countries, as it has become clear that some impacts are now unavoidable in the short to medium term. Mitigation is necessary but adapting to future risk is more important for immediate and long term action for various actors including government, development partners, research organizations, and community organizations.

Several countries follow their own approaches of adaptation for climatic changes based on the local characteristics as well as general barriers to adaptation, such as ecological, financial, institutional, technological, information and cognitive hurdles. Malaysia is on the process to develop its adaptation approaches. It should carefully determine its adaptation policy based on climate change relevant potential socioeconomic vulnerability among different stakeholders at different levels.

Agricultural adaptation options regarding climatic change in Malaysia should be followed in farm or individual farmer level, and policy level. Technological advancement needs to be focused to ensure its most crucial roles to solve the problem in the long run. Government bodies also need to take preferable subsidy policies and ensure financial sustainability for the farmers and farm. Overall, co-operation among different groups, stakeholders, and agencies is very important to better cope with the changing nature of climatic factors.

References

- Alam, M. M., Siwar, S. and Toriman, M. E. 2009. Rainfall Variability, Water and Agricultural Sustainability: A Socioeconomic Study of Vulnerability and Adaptation of Climate Change, Case of Paddy Farming in North West Selangor, Malaysia. Proceedings of the *International Conference on Water, Environment, Energy and Society*, S R K College, Agra University, India, Jun 28-30.
- Baker, J. T. and Allen, Jr. L. H. 1993. Contrasting crop species responses to CO₂ and temperature: rice, soybean and citrus. *Vegetatio* Vol.104/105, pages 239-260.
- FAO. 2003. "World Agriculture towards 2015/2030: An FAO Perspective". Rome: Food and Agriculture Organisation of the United Nations.
- IPCC. 2001. "Climate Change 2001: Impacts, Adaptation and Vulnerability". IPCC Third Assessment Report, Cambridge University Press.
- NAHRIM. 2006. "Final Report: Study of the Impact of Climate Change on the hydrologic Regime and Water Resources of Peninsular Malaysia", National Hydraulic Research Institute of Malaysia (NAHRIM) and California Hydrologic Research Laboratory (CHRL).
- NRS. 2001. "National response strategies to climate change", Ministry of Science, Technology and the Environment, Malaysia.

- Singh, S., Amartalingam, R., Wan Harun, W.S. and Islam, M.T. 1996. Simulated impact of climate change on rice production in Peninsular Malaysia, Proceeding of *National Conference on Climate Change*. UPM, pages 41-49.
- Smit, B. and Skinner, M.W. 2002. Adaptation Options in Agriculture to Climate Change: A Typology. *Mitigation and Adaptation Strategies for Global Change*, 7, 85–114.
- Tashiro, T. and Wardlaw, I. F. 1989. A comparison of the effect of high temperature on grain development in wheat and rice, *Annals of Botany*, Vol 64, pages 59-65.
- UNDP. 2005. “Adaptation policy framework for climate change: Developing policies strategies and measures”, B. Lim and E. Spanger-Sieghred (eds.), Cambridge University Press.
- Yohe, G. and Tol, R. S. J. 2001. Indicators for social and economic coping capacity: Moving toward a working definition of adaptive capacity, *Global Environmental Change*, Vol 12, pages 25-40