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Article

Climate change challenges: Case of the Thai agriculture business sector

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Abstract: Climate change and its effects are accelerating, with climate-related disasters piling up season after season. This study explores the impact of climate change on Thailand's agricultural business by examining the views and experiences of stakeholders in the sector. Through in-depth interviews and thematic analysis, the study reveals the multifaceted challenges faced by the agricultural community. Participants highlight the disruptive effects of irregular rainfall patterns and rising temperatures on crop productivity and economic stability, exacerbating food shortages and livelihood insecurity. Additionally, the study underscores the critical issue of food security and the need for resilient agricultural practices. Furthermore, the inadequate integration of climate change education in the Thai education system and its implications for farmer adaptation are discussed. The study emphasizes the urgent need for comprehensive support measures and a holistic approach to address climate change impacts on Thailand's agricultural sector, ensuring its sustainability and the well-being of farmers.

Keywords: climate change; sustainable development; agriculture; Thailand

1. Introduction

Climate change poses a wide range of challenges and impacts across different sectors. The adverse effects of climate change are diverse, affecting agriculture, biodiversity, and human health [1,2]. Climate change can result in changes in land surface phenology, impacting ecosystems and biodiversity [3].

The consequences of climate change extend beyond environmental aspects to socio-economic factors, with developing economies projected to shoulder a significant burden [3,4]. Challenges related to climate change are further complicated by factors such as poverty, high population density, and existing inequalities [5,6].

Adapting to climate change is essential, as evidenced by farmers in regions like the Nile Basin of Ethiopia making decisions on adaptation strategies to alleviate the effects of climate change on agriculture [7]. Smallholder farmers in Sri Lanka have been observed implementing perception-driven coping mechanisms to address climate change impacts, such as adjusting their agricultural practices to combat crop failure [8]. Nevertheless, despite these initiatives, the challenges posed by climate change persist, necessitating a deeper comprehension of how societies confront and respond to these challenges [9].

Furthermore, the impacts of climate change go beyond environmental and economic domains to impact public health, with vulnerable populations like teenagers being particularly at risk of the health consequences of climate change [10]. The imperative for policy interventions and mitigation strategies to tackle the impacts of climate change is evident, underscoring the importance of enhanced planning and readiness for health-related consequences, akin to the lessons learned from the COVID-19 pandemic.

Indeed, climate change presents a complex and multifaceted challenge with widespread implications for agriculture, biodiversity, human health, and socio-economic systems. Addressing these challenges demands a comprehensive understanding of the various factors at play and the formulation of adaptive strategies to mitigate the adverse effects of climate change.

2. Situation in Thailand

Thailand is indeed facing significant challenges due to climate change. The situation of climate change in Thailand is a pressing issue that requires immediate attention and concerted efforts from various stakeholders. By understanding the specific vulnerabilities and impacts of climate change on different sectors, Thailand can develop effective adaptation strategies to build resilience and mitigate the adverse effects of a changing climate.

Studies have shown that the country is highly vulnerable to climate change impacts such as floods, droughts, sea-level rise, and changes in precipitation patterns [11–13]. The observed trends indicate that Thailand has experienced significant warming over the past four decades, leading to changes in extreme temperature events [14]. Additionally, the country is projected to experience increased risks of flooding and drought, which will impact various sectors, including agriculture and water resources [15,16].

The impacts of climate change in Thailand are diverse and affect different aspects of the country. For instance, the agriculture sector, which is crucial for the country's socio-economic development, is particularly vulnerable to climate fluctuations, including changes in rainfall patterns and temperatures [16,17]. Furthermore, coastal regions, such as the Andaman Coast, and islands, such as Koh Phi Phi, are at risk of sea-level rise, which could have detrimental effects on tourism and local communities [18].

Efforts are being made to address climate change adaptation in Thailand. Studies have highlighted the importance of developing adaptation strategies for various sectors, such as energy, agriculture, and urban planning, to mitigate the impacts of climate change [15,19–21]. Additionally, there is a growing recognition of the need for policy and legal interventions to manage the atmosphere effectively and transition towards a low-carbon society [22].

The situation of climate change in Thailand is a pressing issue that requires immediate attention and concerted efforts from various stakeholders. By understanding the specific vulnerabilities and impacts of climate change on different sectors, Thailand can develop effective adaptation strategies to build resilience and mitigate the adverse effects of a changing climate.

One of the key vulnerabilities in Thailand is the impact of climate change on agriculture. The changing weather patterns, including irregular rainfall and an increased frequency of extreme weather events such as droughts and floods, pose a significant risk to the country's agriculture sector. This has direct implications for food security, rural livelihoods, and the overall economy.

In light of these vulnerabilities, it is imperative for Thailand to prioritize adaptation measures that encompass a range of strategies, including sustainable land

and water management, coastal protection and restoration, urban planning and design, and the promotion of climate-resilient agricultural practices. Collaboration among government agencies, local communities, civil society organizations, and the private sector is essential to ensuring the successful implementation of these adaptation strategies. The research question for this paper is set as follows:

What is the impact of climate change on Thailand's agricultural business?

3. Research design

The research design is informed by a phenomenological approach, aiming to uncover the lived experiences and perceptions of key stakeholders within Thailand's agricultural sector regarding climate change impacts.

3.1. Data collection

Semi-structured interviews serve as the primary data collection method. This approach allows for flexibility and depth in exploring participants' perspectives, while also ensuring consistency across interviews. Participants were selected based on their expertise, involvement in agricultural activities, and geographical representation across different regions of Thailand.

Interviews were conducted with a diverse range of stakeholders involved in Thailand's agricultural business, including five farmers, three agricultural policymakers, three industry experts, and two representatives from relevant government agencies and non-governmental organizations (NGOs). Purposeful sampling was employed to ensure representation of various perspectives and experiences related to climate change impacts on agriculture in Thailand.

Probing questions were designed by the researcher and used to explore participants' perceptions of climate change impacts on different aspects of agricultural business, including crop yields, water availability, pest and disease prevalence, market dynamics, and adaptation strategies.

3.2. Data analysis

Thematic analyses were employed to identify recurring patterns, themes, and insights within the interview data. Transcribed interviews were initially coded and analyzed iteratively, allowing for the emergence of key themes related to climate change impacts on Thailand's agricultural business.

To enhance the trustworthiness and rigor of the study, strategies such as member checking, peer debriefing, and reflexivity were also employed. Member checking involves sharing key findings with participants to verify accuracy and enhance credibility.

3.3. Ethical considerations

This study adheres to ethical guidelines and obtains ethical approval from the American University of Business and Social Sciences review board. Informed consents are obtained from all participants, ensuring confidentiality, anonymity, and voluntary participation.

4. Findings

4.1. Climate change and overall production

Climate change has had significant impacts on agriculture in Thailand, affecting crop yields and overall production. It was addressed by the participants that rising temperatures and changes in precipitation patterns due to climate change can lead to severe damage to crop yields. The vulnerability of the agricultural sector to climate change can result in a decrease in agricultural production, impacting the livelihoods of farmers and their families. Unstable weather conditions, including extreme temperatures, droughts, and changes in rainfall patterns, have started to impact their work, contributing to crop failures and planting difficulties.

Some participants addressed irregular rainfall patterns as a major problem. Climate change can lead to unpredictable rainfall patterns, with periods of drought followed by heavy rainfall events. and flooding. These variations in precipitation can significantly affect crop yields, leading to food shortages and economic instability in rural areas.

Rising temperatures can negatively impact crop productivity, as certain crops may struggle to adapt to the changing climate conditions. This can lead to reduced agricultural output and income for farmers, further exacerbating food insecurity and poverty in the agricultural sector.

4.2. Food security

Views from delegates who work in the agricultural sector also emphasize how climate change poses a threat to food security and local economic stability. The condition of the weather, level of rain, and changes in the pattern of nature in the hometown where subsistence agriculture is practiced make rural communities highly vulnerable to the negative impacts of climate change on agricultural and food production.

Developing drought-resistant crop varieties, implementing efficient water management techniques, and promoting agroforestry and sustainable land use practices are essential steps in building resilience in the agricultural sector. Furthermore, providing farmers with access to climate information, financial resources, and knowledge exchange on climate-smart agricultural techniques will be crucial for enhancing the sector's resilience. This issue can be related to the global food issue. For instance, the projected declines in sugarcane production, a vital crop for Thailand's economy, could adversely affect the well-being of sugarcane growers and global sugar prices.

Climate-smart agriculture is seen as a promising approach to enhance food productivity, build resilience in agricultural systems, and reduce greenhouse gas emissions in response to climate change impacts. Additionally, technological advancements play a role in helping farmers adapt to changing climatic conditions, although the rate of technological changes may outpace the rate of climate change impacts on agriculture in Thailand.

The effects of climate change on food security in Thailand are multifaceted, encompassing changes in temperature, precipitation, extreme weather events, and crop

yields. Implementing effective adaptation strategies and policies is essential to safeguarding the agricultural sector and ensuring food security in the face of a changing climate.

4.3. Education issues

Climate change topics are poorly integrated into the Thai education system, particularly in rural areas. In agricultural education for Thai farmers, climate change is lacking, with teachers ill-prepared to teach the subject matter effectively. Theoretical teaching of climate change and agriculture does not translate into practical knowledge for students.

Research funding and collaboration on climate change and farmers' readiness for this issue are insufficient. Many individuals perceive climate change and environmental issues as unrelated or unimportant, leading to apathy towards measures in the education sector.

Limited understanding and attention to preventative strategies in agriculture results in reactive rather than proactive behaviors among Thai farmers when it comes to climate change adaptation.

Participants in this study suggested that we should integrate climate change education into all educational sectors. Thai policymakers should prioritize the integration of climate change topics into the national education curriculum, particularly in rural areas where awareness and understanding of climate change may be limited. Providing teachers with training and resources on climate change education can enhance their capacity to teach the subject effectively and equip students with the knowledge and skills needed to address climate-related challenges.

Some participants agreed that improving public health education is essential for raising awareness about the health impacts of climate change and promoting preventive measures among the general population. Thai policymakers should invest in teacher training programs, curriculum development, and educational campaigns to ensure that public health education is comprehensive, accessible, and culturally relevant.

To bridge the gap between theoretical knowledge and practical application, Thai policymakers should promote experiential learning and hands-on activities that allow students to apply their knowledge of climate change and public health in real-world contexts. Field trips, community engagement projects, and interactive learning experiences can help students develop practical skills and foster a deeper understanding of the connections between climate change, public health, and environmental sustainability.

4.4. Climate change and farmers

Climate change has a profound impact on the lives of farmers in Thailand, posing significant challenges to their livelihoods and overall well-being. Climate change has disrupted traditional farming practices in Thailand, leading to increased uncertainty and risk for farmers. The irregular rainfall patterns and increased temperatures have made crop cultivation more challenging, affecting agricultural output and farmers'

incomes. Additionally, the prevalence of pests and diseases has caused substantial losses for farmers, further exacerbating the already precarious situation.

In response to these challenges, it is crucial for the Thai government to implement comprehensive support measures for farmers. This includes providing access to climate-resilient seeds and agricultural technology, as well as offering training and education on sustainable farming practices. Financial assistance and insurance programs can also help mitigate the economic impact of climate-related losses on farmers, ensuring their livelihoods and well-being are safeguarded.

Furthermore, fostering knowledge exchange and collaboration among farmers, research institutions, and agricultural experts can facilitate the sharing of best practices and innovative strategies for climate-resilient agriculture. By creating a supportive environment for farmers and empowering them with the necessary tools and resources, Thailand can strengthen its agricultural sector against the challenges of climate change [23].

The holistic approach to enhancing agricultural resilience outlined above not only addresses the immediate threats posed by climate change but also contributes to the long-term sustainability and prosperity of the agricultural community in Thailand. By prioritizing the well-being of farmers and the resilience of the agricultural sector, Thailand can navigate the challenges of climate change and secure a stable and prosperous future for its agricultural industry.

5. Conclusion

In conclusion, this study has shed light on the multifaceted challenges that climate change poses to Thailand's agricultural business, as articulated by the participants. Four overarching themes emerged from the discussions, each highlighting the intricate interplay between climate variability and its impacts on agricultural livelihoods, food security, education, and the well-being of farmers.

The first theme underscored the disruptive effects of irregular rainfall patterns and rising temperatures on crop productivity and economic stability in rural areas. Participants voiced concerns over the unpredictability of precipitation, leading to periods of droughts and floods that significantly affect crop yields and exacerbate food shortages.

Linked closely to this, the second theme emphasized the critical issue of food security, particularly in vulnerable rural communities reliant on subsistence agriculture. Climate change threatens local economic stability and food production, necessitating the adoption of resilient agricultural practices and the provision of support mechanisms to mitigate its adverse effects.

Furthermore, the lack of integration of climate change education in the Thai education system emerged as a significant challenge. Participants highlighted the inadequate preparation of educators and the limited attention given to climate-related topics in agricultural education. Addressing this issue requires concerted efforts to enhance climate literacy among students and educators, bridging the gap between theoretical knowledge and practical application.

Lastly, the profound impact of climate change on farmers' livelihoods and overall well-being was evident. Disrupted traditional farming practices, increased uncertainty,

and heightened risk underscored the urgent need for comprehensive support measures. These include access to climate-resilient seeds and technologies, financial assistance, and knowledge exchange platforms to empower farmers to adapt to climate change.

Moving forward, addressing these challenges demands a holistic approach that integrates scientific research, policy interventions, and community engagement. By prioritizing the resilience of the agricultural sector and the well-being of farmers, Thailand can navigate the complexities of climate change and pave the way for a sustainable and prosperous future. Through collaborative efforts and innovative solutions, Thailand can emerge stronger and more resilient in the face of evolving climate threats, ensuring the continued vitality of its agricultural industry and the welfare of its farming communities.

6. Recommendations

Addressing the complex intersection of climate change and public health in Thailand requires a multifaceted approach that tackles systematic and administrative issues, improves education and awareness, and empowers individuals to take proactive measures to protect their health and the environment. By addressing these key challenges, Thai policymakers can enhance the resilience of communities and reduce the health risks associated with climate change. Here are some suggestions for mitigating the impact of climate change on the health of Thai citizens:

According to the themes from this study, when it comes to supporting the process of policy development and implementation, they should prepare to bring a variety of issues to stakeholders in agriculture. The Thai government should formulate and implement comprehensive climate change adaptation policies specifically tailored to the agricultural sector.

They can also invest in research and development by allocating funding for research on climate-resilient crop varieties and sustainable agricultural technologies. More importantly, facilitate collaboration between research institutions, agricultural experts, and farmers to co-develop and disseminate innovative solutions.

Support for community leaders and capacity building will be useful for the rural areas of Thailand. Thai policymakers should provide support and resources to empower community leaders to understand and expand the concept and actions to mitigate climate change impacts on the environment within their communities. This support could include training programs, capacity-building workshops, and educational materials focused on climate change awareness, adaptation strategies, and sustainable environmental practices. By equipping community leaders with the knowledge and skills to mobilize their communities, policy makers can foster grassroots engagement and empower communities to take meaningful action to address climate change.

Promoting awareness about climate change through education seems to be an important and powerful method to mitigate risks relating to climate change. Education can enhance public awareness and risk perception of climate change, which are essential for taking informed actions to mitigate its impacts. Furthermore, school-based education has the potential to incorporate the prevention and health co-benefits of climate mitigation and adaptation within the curriculum, thereby contributing to

addressing climate change and its impacts [21,24]. emphasized that sustainable education equips young people with the necessary knowledge and skills to understand and implement the changes required for mitigating climate change and global warming.

Finally, working with the local farmers on promoting how to collaborate with fellow farmers, local communities, and relevant stakeholders to share knowledge, resources, and experiences in adapting to climate change will be helpful for them. If they participate in collective action initiatives, such as farmer cooperatives and community-based adaptation projects, to strengthen resilience at the community level, they will be prepared to mitigate climate change risks.

By implementing these suggestions collaboratively, the Thai government and farmers can work together to build resilience, adapt to climate change, and ensure the long-term sustainability and prosperity of the agricultural sector in Thailand.

Ultimately, by heeding the insights and recommendations presented herein, Thailand can chart a more resilient and sustainable path forward in the face of climate change. It is our collective responsibility to act decisively and inclusively, ensuring a brighter and more sustainable future for generations to come.

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