ESI Preprints **Not Peer-reviewed**

The Impact of Saltwater Intrusion on Rice Cultivation and Aquaculture in Ham Tan commune, Tra Cu District, Tra Vinh Province, Mekong Delta, Vietnam

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Doi: 10.19044/esipreprint.7.2023.p39

Approved: 03 July 2023
Posted: 05 July 2023

Cite As:
Hoa L.T. (2023). *The Impact of Saltwater Intrusion on Rice Cultivation and Aquaculture in Ham Tan commune, Tra Cu District, Tra Vinh Province, Mekong Delta, Vietnam.* ESI Preprints. https://doi.org/10.19044/esipreprint.7.2023.p39

Abstract

This article discusses the impact of saltwater intrusion on rice cultivation and aquaculture in Ham Tan commune, Tra Cu District, Tra Vinh Province, Mekong Delta, Vietnam. Based on in-depth interviews and sociological surveys conducted in Ham Tan commune, Tra Cu District, Tra Vinh Province, the article highlights the main findings. Firstly, rice cultivation and aquaculture in Ham Tan are multidimensionally affected by the negative impacts of saltwater intrusion. Secondly, saltwater intrusion reduces crop yields and decreases the area available for rice cultivation. It also increases labor days and investment costs in rice production. Thirdly, saltwater intrusion decreases the productivity of aquaculture. In fact, a significant number of households engaged in aquaculture experienced complete losses due to saltwater intrusion.

Keywords: Saltwater intrusion, aquaculture, rice cultivation, Mekong Delta, Vietnam

Introduction

The Mekong Delta, also known as the "Rice Bowl" of Vietnam, is a vital agricultural region and a major contributor to the country's food production. With the importance of the Mekong Delta, many studies have been conducted to understand this region from various perspectives. Navin

Singh Khadka emphasizes the richness of the Mekong Delta. However, the area is facing alarming issues related to saltwater intrusion, the increasing number of hydropower plants. These activities have resulted in the erosion of 500 hectares of land annually (Khadka 2015). Pham Hong Giang discusses the impact of upstream infrastructure on the downstream Mekong Delta. From the current situation of hydropower dam construction, the environmental impact, river flow, and fisheries are receiving more attention. Evaluating the involvement of major powers in Mekong regional cooperation, other countries have shown high expectations for collaborative efforts in changing and developing the Mekong River Basin (Pham Hong Giang 2010).

The Mekong Delta is facing a significant challenge – saltwater intrusion (Lâm Nguyễn 2017; Nguyễn Thị Hồng Điệp, Danh Huội and Nguyễn Trọng Cần 2017; TTKNQG 2020). Saltwater intrusion occurs when seawater infiltrates into freshwater sources, affecting agricultural activities and posing a threat to the livelihoods of millions of people in the region. Therefore, it is crucial to study and understand the impacts of saltwater intrusion in the Mekong Delta. Understanding the impacts of saltwater intrusion on agriculture is essential for developing effective adaptation strategies. The Mekong Delta is predominantly an agricultural region, with rice cultivation and aquaculture being the main economic activities. Saltwater intrusion can have devastating effects on these sectors, leading to reduced crop yields, increased soil salinity, and changes in the types of crops that can be cultivated. In order to broaden the understanding of the impact of saltwater intrusion in the Mekong Delta, this article examines the effects of saltwater intrusion on rice cultivation and aquaculture in a specific locality within the Mekong Delta. The focus is on Ham Tan, a commune in Tra Cu district, Tra Vinh province.

Research Area and Methodology

The data used in this article is derived from a sociological survey based on quantitative questionnaires and in-depth interviews conducted in Ham Tan commune, Tra Cu district, Trà Vinh province. Ham Tan is a commune within Tra Cu district, Trà Vinh province. It covers a natural area of 2,098 hectares. As of 2018, the population of the commune consisted of 2,253 households residing in various administrative areas, including 8 hamlets (People's Committee of Ham Tan commune 2018 2018).

The primary livelihood in Ham Tan is agricultural production. The total rice cultivation area in the commune is 620.9 hectares, with an average yield of 4.65 tons per hectare and a total production of 2,990 tons (People's Committee of Ham Tan commune 2018). Regarding aquaculture, the total fishery production in 2018 reached 4,085.09 tons, with an aquaculture area

of 103.5 hectares (People's Committee of Ham Tan commune 2018). The social survey employed a combination of quantitative questionnaires and in-depth interviews to collect data on the impact of saltwater intrusion on rice cultivation and aquaculture in Ham Tan commune.

The field research in Tra Vinh was conducted within the framework of the project "Evaluation of the Impacts of Climate Change, Natural Disasters, and Human Activities to Propose Sustainable Development Models in the Hau River Delta" sponsored by the Ministry of Natural Resources and Environment of Vietnam. Under this project, several localities in the Hau River Delta were surveyed, including Ham Tan commune in Tra Cu district, Tra Vinh province; Long Phu commune in Long Phu district, Sac Trang province; Thoi An ward in O Mon district, Can Tho city; Tan Hoa commune in Lai Vung district, Đong Thap province; Long Kien commune, in Cho Moi district, An Giang province; and Khanh An commune in An Phu district, An Giang province. Data collection in these localities took place in August 2019.

In Ham Tan commune, sociological surveys were conducted among 202 households. Additionally, 15 in-depth interviews were carried out with residents and local leaders of Ham Tan commune. The purpose of these surveys and interviews was to gather data and insights regarding the impact of climate change, natural disasters, and livelihood activities in the area.

The Impact of Saltwater Intrusion on Rice Cultivation and Aquaculture

In recent years, saltwater intrusion has had a significant impact on the lives and production in the Mekong Delta. For instance, the saltwater intrusion episode in late 2015 and early 2016 was particularly severe and considered the most intense saltwater intrusion in the past 100 years. This event began in February and affected all 13 provinces in the Mekong Delta region. The saltwater intrusion caused extensive damages to agricultural production, including rice cultivation, horticulture, and fruit orchards. Specifically, the 2015-2016 saltwater intrusion resulted in over 160,000 hectares of agricultural land, primarily rice fields, as well as fruit and vegetable crops, being affected by salinity. The estimated economic losses amounted to around 3,000 billion Vietnamese dong (Nguyen Ngọc Anh 2016)

In Ham Tan, the survey results indicate that 88.4% of respondents stated that saltwater intrusion has reduced the rice productivity of their households in the past 5 years (as of the survey period). Therefore, the impact of saltwater intrusion on rice cultivation, particularly the decrease in rice productivity over the past 5 years in Ham Tan, is a very serious issue. According to statistics from the People's Committee of Trà Vinh province, as of February 2020, approximately 5,177 hectares of rice belonging to 6,710

households were damaged due to saltwater intrusion (accounting for 78% of the total rice-growing households). The major damages were concentrated in districts such as Tra Cu, Cau Ngang, Chau Thanh, Duyen Hai, Cau Ke, and Tieu Can, with losses ranging from 30% to 70%. Thus, saltwater intrusion has significantly affected rice cultivation for the residents of Ham Tan specifically and Trà Vinh province as a whole.

The survey results in Ham Tan also revealed that 73.8% of respondents believed that saltwater intrusion would continue to reduce the rice productivity of their households in the next 5 years. Not only does saltwater intrusion decrease rice cultivation productivity, but it also leads to the inability to cultivate the third rice crop in Ham Tan. In order to utilize the fallow land during the uncultivable rice season, many residents have switched to planting water spinach, a crop that provides better income and is more salt-tolerant. However, when the land is heavily affected by saltwater, even water spinach cannot survive. To mitigate the damage for the people, the local authorities have encouraged them to refrain from cultivating the third crop. As a result, previously, the residents in the area could grow rice for three crops per year, but in recent years, they can only cultivate two crops, resulting in a reduction of one crop per year. From a certain perspective, ceasing the cultivation of the third crop in some areas due to saltwater intrusion will lead to a decrease in rice cultivation area in the Mekong Delta region and the country as a whole, including Ham Tan. This poses a challenge to ensuring the stability of rice cultivation area in the future for the region and the country.

Not only does saltwater intrusion reduce productivity and cultivated area, but it also has an impact on increasing labor intensity and investment costs in rice cultivation in the region. In Ham Tan, 63.5% of respondents in the survey stated that they had to incur additional investment costs in rice production in recent years due to the impacts of saltwater intrusion. Moreover, saltwater intrusion poses an even greater risk for rice farmers, as they may lose an entire crop season. The results of the social survey in Ham Tan revealed that 9.2% of respondents reported that in the past 5 years (up to the survey period), their households had completely failed to harvest any crops due to saltwater intrusion.

Regarding the impact of saltwater intrusion on rice cultivation, Nguyen Tuan Anh and colleagues, based on survey data from six communes in the provinces of Tra Vinh, Soc Trang, Dong Thap, An Giang, and Can Tho in the Mekong Delta, have identified a significant portion of respondents in a sociological survey who assessed the negative effects of saltwater intrusion on rice cultivation. Up to 68.8% of respondents believed that saltwater intrusion had negative impacts on rice cultivation. This means that for a responding household, saltwater intrusion could have various effects on

their rice cultivation. The negative manifestations were observed in multiple aspects, including a reduction in cultivated area, decreased productivity, increased labor intensity, rising investment costs, crop losses, and areas where rice cultivation was no longer possible. Among these, the four most notable negative consequences were decreased productivity (17.8%), increased labor intensity (16.4%), higher investment costs (20.9%), and crop losses (9.1%) (Nguyen Tuan Anh, Mai Trong Nhuan, and Nguyen Tai Tue, eds. 2020).

Saltwater intrusion also has a significant impact on aquaculture, particularly traditional fish farming and brackish water shrimp farming. Survey results from aquaculture households in Ham Tan indicate that aquaculture is heavily affected by saltwater intrusion in the area. A sociological survey conducted in Ham Tan revealed that 27.8% of aquaculture households assessed that saltwater intrusion has reduced their productivity. Specifically, for many households in Ham Tan, raising snakehead fish is a common practice. However, when saltwater intrusion occurs, the fish cannot survive. The smaller the fish, the higher the risk posed by saltwater intrusion. To adapt to saltwater intrusion, many households have drilled wells to obtain water for snakehead fish farming, but they still face numerous difficulties due to the depletion of groundwater resources over time.[1]

Not only has saltwater intrusion reduced productivity, but in certain instances over the past 5 years, it has resulted in a complete loss for 11.1% of aquaculture households. Therefore, from a certain perspective, saltwater intrusion not only decreases productivity but also causes significant losses for many aquaculture households in Tra Vinh in specific instances over the past 5 years. This poses a major challenge for aquaculture households in Ham Tan.

Regarding the impact of saltwater intrusion on aquaculture, Nguyen Tuan Anh and colleagues based on survey data from 6 communes in the provinces of Tra Vinh, Soc Trang, Dong Thap, An Giang, and Can Tho City in the Mekong Delta, have indicated that a significant portion of respondents in these locations assessed saltwater intrusion as having negative effects on their aquaculture activities. In fact, certain aquatic species have difficulty growing or surviving in the presence of saltwater intrusion, particularly when the salinity level is high. The data reveals various aspects that reflect the negative impact of saltwater intrusion on aquaculture, including: reduced farming areas, decreased productivity, increased labor demands, higher investment costs, and instances of crop failure. Notably, more than one-third of respondents, specifically 33.8%, stated that saltwater intrusion has led to

[1] Interview with officials of Ham Tan commune, Tra Cu district, Tra Vinh province.

increased costs in their aquaculture operations (Nguyen Tuan Anh, Mai Trong Nhuan, and Nguyen Tai Tue eds. 2020).

Conclusion

In the current context of climate change, saltwater intrusion poses a significant challenge to the development of the Mekong Delta. It has multidimensional impacts on the economy, society, and the environment. Research findings from Ham Tan commune, Tra Cu district, Tra Vinh province, indicate that rice cultivation and aquaculture are livelihoods that are profoundly affected by the negative impacts of saltwater intrusion.

One of the key impacts of saltwater intrusion is the reduced productivity of rice cultivation. The intrusion of saltwater renders the soil less fertile and suitable for rice cultivation. As a result, farmers experience decreased yields and financial losses, leading to food insecurity and economic challenges for the region

Aquaculture, another important economic activity in Ham Tan, is also greatly affected by saltwater intrusion. Many species of fish and shrimp raised in freshwater environments are sensitive to changes in salinity levels. The intrusion of saltwater into aquaculture ponds disrupts the breeding and growth of aquatic species, leading to decreased production and income for aquaculture farmers. This not only impacts the livelihoods of local communities but also affects the availability and affordability of seafood resources

In conclusion, saltwater intrusion presents a significant challenge to the development of the Ham Tan in the context of climate change. Its adverse impacts on agriculture and aquaculture require urgent attention and concerted efforts from various stakeholders. By implementing adaptive strategies and promoting international cooperation, we can effectively mitigate the impacts of saltwater intrusion and secure the sustainable development of Ham Tan, as well as the broader Mekong Delta region, in response to the challenges posed by climate change.

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