



High-Tech Agriculture and Climate Change: Case of Tien Giang Province, Viet Nam



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Introduction

Climate change is an unavoidable problem and it has direct and indirect impacts on all of us. According to scientists, Vietnam is one of the countries heavily hit by climate change (Central Vietnam Farmers Association, 2019). In particular, the Mekong Delta is one of the three deltas most heavily affected by climate change in the world. Impacts of climate change have been observed in the Mekong Delta for many years, with increasing levels of intensity. As one of the key agricultural provinces in the Mekong Delta, in the past years, Tien Giang province has been suffering from the impacts of climate change, especially its agricultural sector (APBAC, 2019). The most typical manifestation is the salinity intrusion in dry season, which makes it difficult for agricultural production for the coastal areas in the east. It has also caused riverside and coastal landslides, etc. To proactively respond to climate change, in the past few years, Tien Giang has mobilized various capital sources for implementing many projects to prevent salinity intrusion and effectively control floods, ensuring fresh water sources for irrigation and daily life, production and preventing river bank and coastal erosion (Vietnamese Environment News, 2015). The initial results of these projects have significantly contributed to the protection of production and stabilization of life for people that are under the impact of climate change. However, due to limited local resources, lack of substantive awareness amid population on climate change, especially urban residents - who are less affected by climate change, the response and adaptation to climate change in the agricultural sector in the province, has not been as effective as expected. This paper aims to provide an overview

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of the technology-led on-going initiatives in the province, to mitigate climate change impacts.

Agricultural Landscape of Tien Giang Province Tien Giang is located along the Tien River - a tributary of the Mekong River, which is adjacent to the East Sea. It has 32 km of coastline and a system of intertwined rivers and canals. Climate change has increased the sea level and also caused intense saline intrusion, affecting many areas of Tien Giang, ecologically. It has brought great difficulties for life and agricultural production which is the the main livelihood of a large proportion of local people. Tien Giang has a fairly developed and diversified agriculture, including crop, fisheries and forestry and covers a significant part of the Mekong Delta region. The province is named as the Kingdom of fruits of the country, with an area of over 70.5 thousand hectares of fruit production, providing over 1.3 million tons of fruit to the market every year (Department of Foreign Affairs of Tien Giang province, 2018). Moreover, Tien Giang also has a large production area of vegetables (over 1 million tons / year), having more than 40 types of vegetables to supply to Ho Chi Minh City and Southeast provinces (Department of Foreign Affairs of Tien Giang province, 2018). Fishery is one of the key economic sectors of the province. Its farming area is over 15,500 hectares. In 2018, the annual output of captured and cultured aquatic products reached over 242 thousand tons (aquaculture products reaches nearly 145 thousand tons), including produces such as pangasius, clam, tiger shrimp (Department of Foreign Affairs of Tien Giang province, 2018). Its livestock production is also quite developed, producing over 8.9 million heads of poultry, over 600 thousand pigs and over 88 thousand cows. The quality of animal husbandry is constantly improved thanks to over 410 farms and the application of scientific and technical advances to production (Department of Foreign Affairs of Tien Giang province, 2018).

Impacts of Climate Change

Despite such a well-developed and diversified agriculture, Tien Giang agriculture sector has

witnessed many difficulties and challenges due to climate change. The following areas have been impacted:

1. **Plantation:** During dry season of 2016 salinity intrusion was witnessed on the estuaries (Tien and Vam Co rivers). In 2015-16, the salinity was high and penetrated into fields faster than the average, affecting the production of winter-spring rice crop in Go Cong region. On the other hand, salt water also made it difficult for irrigation, affecting rice cultivation model combined with fish farming inside the fields (Nguyen Hong Thuy. 2016).

According to a report in 2015-2016, saline intrusion caused damage of estimated VND72,360 billion to 3,284,446 hectares of winter-spring rice; 15,562 billions dong for 113 hectares of fruit trees (it was observed that 20 hectares of longan couldn't be harvested because of cracking; 93 hectares of custard apple trees became weak due to lack of water); 40 hectares of lemongrass died because of drought, causing damage of estimated VND 1,260 billion (Sebastian et al., 2016). 2. **Livestock feed production:** Climate change led high temperatures, changes in rainfall, increased floods and droughts, has been affecting animal feed production systems (reducing food production), which has caused lack of water supply, imbalance of ecological environment and reduction of pasture productivity. The consequence of this change is to reduce the resistance of livestock, increase the likelihood of outbreaks of diseases, reduce the growth and reproduction productivity of livestock, leading to low production efficiency. Water scarcity pushed up the cost of water supply for livestock production. Climate change has made erratic weather change, affecting tolerance level of some species, thereby creating conditions for some harmful microorganisms to cause diseases for animals (Nguyen Hong Thuy. 2016). In 2010, according to the report of the Steering Committee for Blue Ear Disease Prevention and Control of Tien Giang province, the outbreak in the province was in 127/169 communes and wards in all 10 districts with 33,830 effected pigs, accounting for 6.2% of total pigs in Tien Giang province. It caused a damage of more than

VND 400 billion (Nguyen Hong Thuy. 2016). In such scenarios, the next section proposes some technology-intensive models to be adopted for addressing climate change related challenges. Some of these technologies are in other countries.

Recent Models of High-Tech Agriculture in Tien Giang

1. Planting melon in net houses using Israeli drip irrigation technology Initial cost to build a net house with an area of 500 m² and drip irrigation system and accessories is about VND 150 million. With this technique, the melon plant can be grown with 4 crops every year. The yield of each crop would reach to about 1.5 tons/500 m², with an average selling price of VND 30,000/ kg, the farmer earns VND 45 million including a profit of 50%, equivalent to VND 22.5 million. So, each hectare of melon has a yield of 30 tons, generating a profit of VND 450 million/crop (Vietnamese News Agency. 2018). With reasonable cost, this model can be applied in eastern areas where there is shortages of water for production in dry seasons. Furthermore, it can also help keep plants away from pest.

2. High-tech chicken farm Use of software to manage chicken farms which includes vaccine management software as well as farm temperature management system that ensures temperature at 27 - 28°C. Also, drinking water treatment and filtration system for chickens, feed management with Cillo automatic spray towers, etc. are helpful ICT enabled systems. A farm in Cho Gao district has adopted software to enhance produce and has witnessed an increase to 330,000 chickens for eggs. The farm has proposed its software to be certified with GLOBALGAP and have its eggs exported to other countries (KFF. 2017).

3. High-tech agricultural zone in the province Tien Giang will invest VND 1,204 billion to build a high-tech agricultural zone covering an area of over 197 hectares. In the immediate future, the province gives special importance to investment and improvement of infrastructure, especially traffic, attracting investment, etc. (Government of Vietnam. 2017). Accordingly, in the first phase (from 2017-2020), the project will

be implemented on a scale of 44 hectares, focusing on investment in technical infrastructure, calling for investment from agricultural enterprises using high technologies. Total mobilized capital for the project is about VND 280 billion; 21 billion out of which is the budget capital, the rest is other capital sources (Government of Vietnam. 2017).

In phase II (from 2021-2030), Tien Giang province will have a total investment of VND 924 billion in 153.3 hectares. This investment will be used to complete the technical infrastructure, the administrative center, the research area, the experimental area, the training of human resources and other services, etc. (Government of Vietnam. 2017).

Suggested Models

According to many forecasts, revolutionary modern science and technology will create completely new technologies that motivate production to develop in depth, reduce the consumption of energy and raw materials, reduce harm to environment, improve the quality of products and services and strongly promote the development of production. In particular, the **industrial revolution 4.0** has impacts on the agricultural sector (Nhan Dan. 2017). Taking advantages of the revolution achievements is what the agriculture sector should do in order to better cope with negative impacts of climate change. The following are some suggested models using high/ smart technologies that can be applied in the province in the context of climate change:

1. Rice production with 4.0 technologies

Technologies 4.0 can be used in rice cultivation for a more effective way of production. In fact, many pilot projects have successfully been implemented in some places in Viet Nam. Technology 4.0 in rice cultivation includes intelligent monitoring buoys helping in enhancing the ability to cope with saline intrusion. Alternating dry-flooded rice cultivation with technology 4.0 includes automatic water level sensors, which automatically updates water level information on the internet environment; intelligent water pump system are remotely controlled by mobile phones

and there are also smart slow-flow fertilization systems (BNN. 2018). Applying technologies 4.0 to rice production will help farmers to better control their production, reduce the impacts of CC and generate higher yield.

2. Using Biotechnology Applied Variants

Currently, initial success was achieved in the research and selection program for rice varieties for affected areas, applying biotechnology. Some rice varieties studied by scientists of Mekong Delta Rice Research Institute such as AS996, OM2517, OM5451, OM6677, OM576, OM6976 and others, have been evaluated and tested in areas affected by alum and salinity. These are varieties capable of tolerating alum and salinity (Dang Cong San. 2016). With the current situation of rice production in eastern area of the province, these varieties can be used in seasons with salinity intrusion.

3. Aquaponics model

Aquaponics is a method of creating natural, environmentally friendly food sources and exploiting the best properties of aquaculture and hydroponic vegetable cultivation with recirculating water.

Aquaponics is a model that saves both fertilizer and human resources costs and creates safe and high-yield vegetables. On average, one hectare can grow 7,000-8,000 vegetables, fish tanks were arranged according to specific models. A 3-month fish tank would harvest approximately between 500 and 1,000 kg. (Khoahoc. 2018).

Conclusion

With available models of high-tech agriculture in the province, the agricultural sector can well adapt to the current situation of climate change and maintain its productivity, which continues to contribute to the economic growth of the province. Provincial authorities should have incentive policies to multiply them in the whole province especially in areas which badly affected by climate change. Also, studying the feasibility of applying the suggested models can resolve problems. Even in such scenarios, incentive

policies hold significance for the successful application and multiplication of these models to maintain sustainable livelihood, for a large part of population as well as agricultural contribution to the provincial economy.

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