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국내 벼 농사의 기후변화 적응기술과 사례

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Adaptation Technologies and Their Examples of Rice Paddy Farming on Climate Change in Korea

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Rice cultivation is the most favorable crop in Korea, where 60% of annual precipitation is concentrated in summer. Rice is one of the most cultivated crops in Korea since the past. It has relatively low fertilizer demand and injury by successive croping, which makes it highly adaptable to climate.

In this study, we introduce the technology development and related adaptation cases for adaptation of rice cultivation for the past 40 years when global warming has progressed rapidly. In recent years, the temperature of Korea has been rapidly increasing due to global warming. Due to recent global warming, the nation's temperatures are also increasing rapidly nationwide, and over the past 40 years, the temperature of Korea has risen by about 1.26°C compared to the early 1980s. By region, the Yeongseo region of Gangwon Province was the highest at 1.76°C and South Jeolla Province was the lowest at 0.96°C.

As the temperature continues to rise, the most considerable part of rice yield and quality is the formation of high temperatures during ripening. Although there are differencies among rice cultivars, the optimum ripening average temperature for the 40 days after heading is 22.7 ℃ for mid type cultivars and 21.7 ℃ for mid-late type cultivars, so it is expected that the rice yield will decrease in the future by the current standard cultivation method. As a result of this global warming, the periods in which rice cultivation could be possible in regions a year has increased compared to the past showing a wide variety from 110 days in Taebaek to 180 days in Busan, and Gwangyang. In addition, considering the optimum yields by regions, the optimal heading period was estimated and the optimal time of transplanting was predicted. In all regions, the transplanting time was delayed by 3-5 days, and that the result is distributed to local farmers for delayed time periods.

In many studies, it is projected that the rice yield will be decreased with increasing temperature. However, the average annual yield of rice has been shown increase trend when we analyed average productivitties of developed varieties for cooked rice since 1980s. Especially in the early 1990 's, it

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showed rapid increase in productivity, and it was evaluated that this period marked a significant shift in the development of rice varieties. The relationship between the average temperature at the time of development and the rice yield was divided by the period before 1996 and after 1996. The higher the average temperature, the lower the yield of the developed varieties until 1996. However, since 1996, the increase in the average temperature did not show a trend of the productivities of the developded varieties.

The climate change adaptability of developed rice varieties was investigated by analyzing the results of growing crops nationwide from 1999 to 2016 and the change in the annual yields of developed varieties and recently developed varieties as basic data to investigate the growth status of the crops in the country. As a result of annual comparisons of the yields of Taebongbyeo (2000) and Ungwangbyeo (2004) developed in the early 2000s for Odaebyeo which was developed in the 1980s, the annual yields were showd relatively higher in varieties in 2000s despite the increase in temperature. The annual yields of Samgwangbyeo (2003) and Saenuribyeo (2007), which were recently developed as mid-late type varieties, were higher than those of the early develped varieties called Chucheongbyeo developed 1970s.

The development direction of rice varieties in response to climate change has been developed so as to possess traits such as disease resistance,lodging resistance, and low or high temperature tolerance. Nampyeong-byeo, which was developed in 1997, was the most populated variety in Honam area until the mid 2000s. However, since the mid 2000s, it has been increasing the damage due to the occurrence of rice leaf blight desease from the mid 2000s. The varieties of Saenuri-byeo have begun to be replaced, and since 2010, the cultivated area has been reversed in Honam area, and it has become the most cultivated variety until recently. As the climate changes, the race and the area of spread of the pathogens of rice are continuously changed, and the development direction of the rice varieties is progressing accordingly.

Despite the rapid increase in temperature, rice cultivation technology and variety development are well coped with. However since the biological potential of rice could be reached their limit, it is necessary to develop continuous response technology.