

Climate changes and oilseed rape production in China

Environmental impacts on oilseed rape production

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Abstract

Significant climate changes in China occurred during recent 100 years: 1) the air temperature is continuously increased with an annual rising of 0.5~0.8°C; 2) the annual average precipitation is increased at the national level, but it has significant difference between periods or regions. China's Oilseed rape production also taken significantly change along with climate changes in recent years. It is indicated that the planting area is significantly increased in recent 30 years. At the end of 2005, the annual planting area of winter oilseed rape reached to 680 million hm², which is about 3.1 times higher than that of the year 1978, especially in Northern Region of China. It was owe to the north cultivation boundary for winter oilseed rape moved northward and the potential planting area increased. And although the average yield per unit is also significantly increased with time, the influences of climate changes on the rapeseeds yield per unit are still unclear. At the end of the year 2008, the average rapeseeds yield per unit reached to 2.5 times higher than that of the year 1978. Several reasons might be responsible for rapeseeds yield per unit increasing, in which the variety renewal and cultivation measures progress is the mainly ones. Meanwhile, the frequency and intensity of agricultural disaster is also significantly increased in recent years. Therefore, the influences of climate changes on the rapeseeds yield are need to further studied.

Keywords: temperature; precipitation; planting area; yield per unit

Introduction

Oilseed rape is one of the world's major oilseed crops. In China, the planting area of oilseed rape and the rapeseed yield have been in the first place in the world. Therefore, it has very important meaning to indicate the influences of climate change on oilseed rape production in China.

Results and Discussion

Characteristics of climate change in China

Because of the effects of global climate change, the climate has been significantly changed in China in the recent 100 years. It is correctly represented in the following aspects: 1) Annual average surface air temperature is significantly increased, especially in the last 50 years, with an annual rising of 0.5~0.8°C, which is slightly higher than that of the global average value ($0.6 \pm 0.2^\circ\text{C}$) (Ding et al., 2006). 2) The annual average precipitation is increased, but there is a significant difference between different periods and regions. For example, the annual precipitation is significantly increased in the Lower Yangtze region, Southeast China and West China, but it is significantly decreased in North China, eastern part of Northwest China and southern part of Northeast China (Ning L., Qian Y.F., 2008). 3) The probability of Extreme Climate Event is significantly increased, which is mainly presented as extreme precipitation and dryness events significantly increased (Qin et al., 2005). 4) The sunshine hours and gross radiation quantity is significantly decreased in nationwide scope, in which the maximum decreasing was obtained in summer and winter (Ding et al., 2006). 5) The CO₂

concentration is continuously increased (Zou Y.C., Yang X.Q., Pan Z.X., et al., 2008). 6) The area of acid rain pollution is constantly increasing (Ren, 1997).

The evolution of oilseed rape annual planting area

In general, the annual planting area of oilseed rape, especially of winter oilseed rape, is significantly increased in China in recent 30 years (Fig. 1). At the end of the year 2005, the annual planting area of winter oilseed rape reached to 680 million hm², which is about 3.1 times higher than that of the year 1978. While, the annual planting area of spring oilseed rape is insignificantly changed in recent 30 years, it was fluctuated about 50 million hm² since the year 2001 (Fig. 1). We also found that, except for in the South China Coast, the planting areas of winter oilseed rape were significantly increased, especially in the Middle Yangtze River, Yellow-Huai River Basin and Sichuan Basin (Fig. 2). These results indicated that the north boundary of winter oilseed rape cultivation is northward moved and the potential area of winter oilseed rape planting is increased.

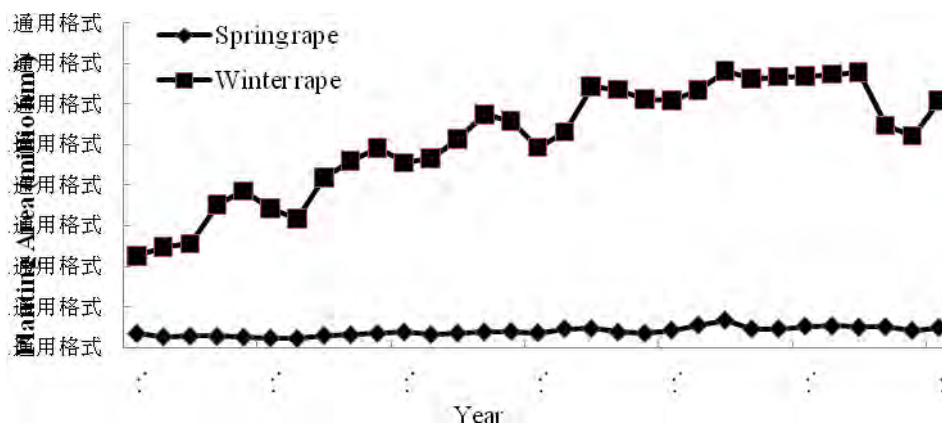


Fig. 1 The evolution of oilseed rape planting area (millionhm²) in China in recent 30 years

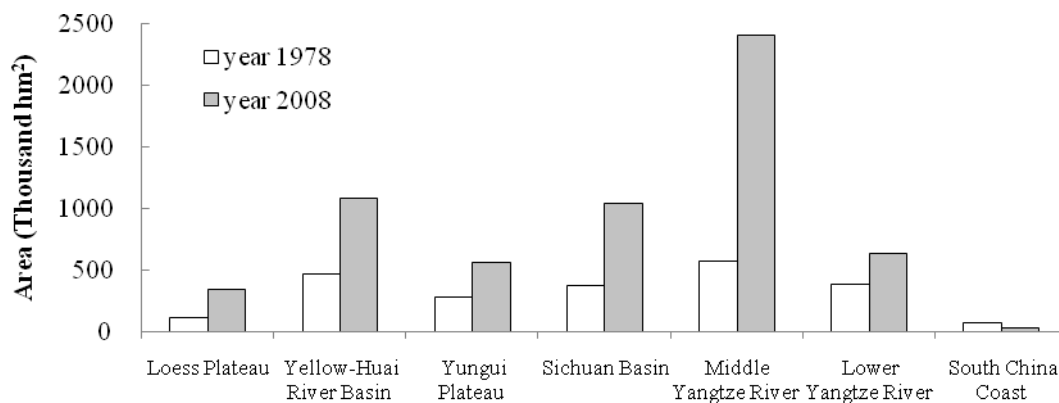


Fig. 2 Winter oilseed rape planting area (thousand hm²) in different regions of China in the year 1978 and 2008

The evolution of rapeseed yield per unit

In China, the rapeseed yield per unit is significantly increased in recent 30 years regardless of winter oilseed rape or spring oilseed rape (Fig. 3). The rapeseed yield per unit of year 2008 reached to 2.5 times higher than that of year 1978. From Fig. 3 we also found that, at the year 1978, the rapeseed yield of spring oilseed rape is about 50% of that of winter oilseed rape, but from the year 1997 to 2008,

there is no significant difference of rapeseed yield per unit between the spring oilseed rape and winter oilseed rape. Therefore, the increasing extent of rapeseed yield per unit of spring oilseed rape is more significant than that of winter rape in China in recent 30 years. Meanwhile, the annual area of agricultural disaster, including drought and freeze, is significantly increased with time in China (Fig. 4), which is due to the probability of Extreme Climate Event is significantly increased. Therefore, the influence of climate change on the rapeseed yield per unit is still unclear.

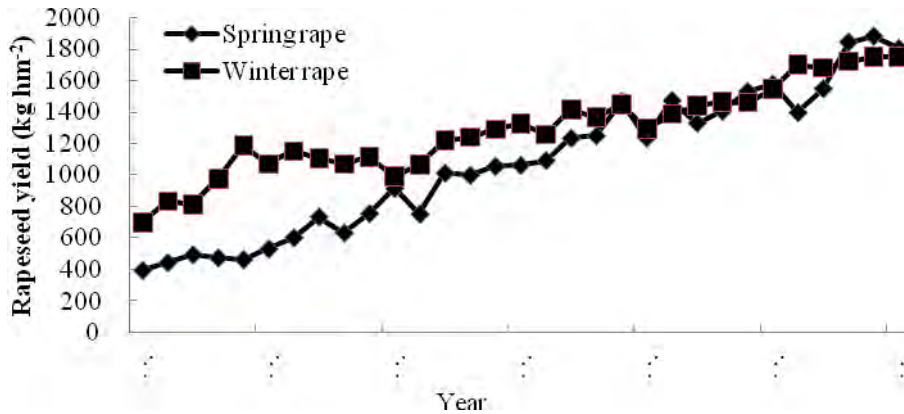


Fig. 3 The evolution of rapeseed yield per unit (kg hm⁻²) in China in recent 30 years

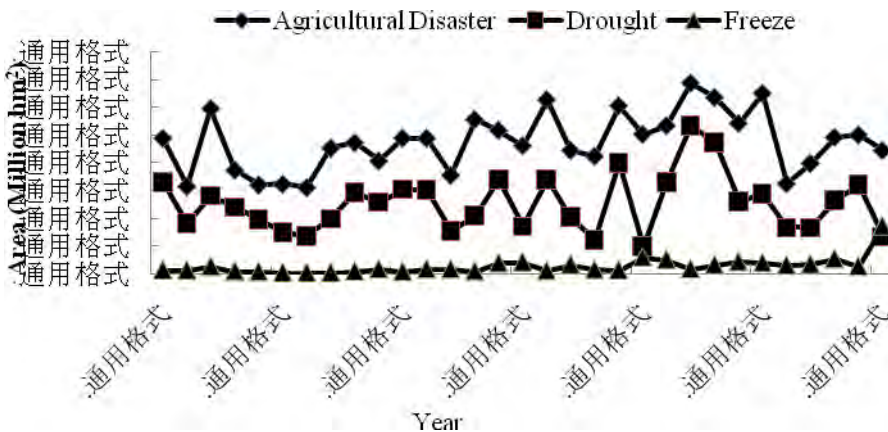


Fig. 4 Agricultural disaster area (million hm²) in China in recent 30 years

Conclusion

In summary, the climate of China was significantly changed in recent years, which is mainly represented in the air temperature and precipitation increased. These changes are beneficial to the planting area (Fig. 1 and Fig. 2) and rapeseed yield (Fig. 3) increasing. On the other hand, the frequency of agricultural disaster is also significantly increased in recent years since the climate changed (Fig. 4), which is play an unfavorable effects on oilseed rape production. Therefore, the influences of climate change on the production of oilseed rape are needed further studied.

Reference

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