

Survey of literature relating to the impact of climate change on wheat

As part of our climate change scenario analyses, we conducted a survey of literature concerning the impact of climate change on the cultivation of wheat, which is a key raw material for the Nisshin Seifun Group. The survey was based on a scenario in which temperatures rise by 3.2°C by the end of this century (the RCP 6.0 scenario in the IPCC's Fifth Assessment Report, the SSP2 "middle-of-the-road" scenario).

(1) Environmental change in wheat-growing regions due to climate change

Forecasts of weather pattern changes under a 3.2°C scenario indicate that the world's average temperature would rise by around 2°C between 2010 and 2050, but that there would regional variation in the extent of temperature increases and rainfall changes. For example, the forecasts suggest that temperatures in the high latitudes of the Northern Hemisphere would increase by over 3°C, while higher temperatures would be accompanied by lower rainfall in some areas in the middle to lower latitudes.*1 (Figures 1, 2)

The potential effects of climate change in wheat-growing regions include a transition to a climate amenable to wheat production in the higher latitudes of the Northern Hemisphere, and reduced suitability for wheat and a heightened risk of droughts in some areas in the middle and lower latitudes.

Fig. 1 Changes in Average Temperature Distribution (2010-2050)

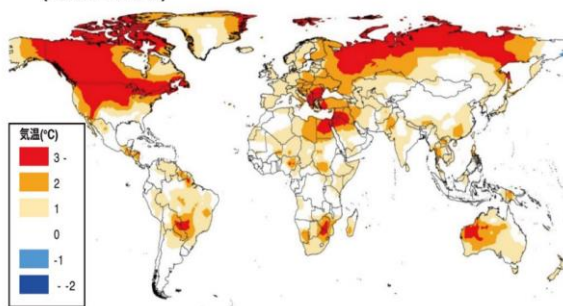
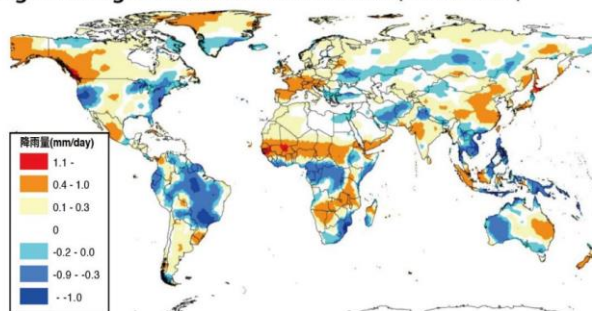


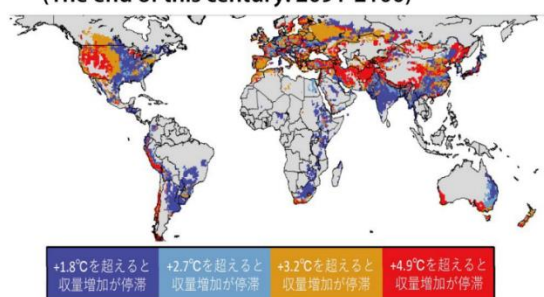
Fig. 2 Changes in Rainfall Distribution (2010-2050)



(2) Outlook for wheat production

The National Agriculture and Food Research Organization, a Japanese government research and development agency, has produced the following forecast about future trends in spring wheat yields. The forecast takes into account not only climate change, but also the effects of technical measures that can be implemented easily, such as the diffusion of existing yield improvement technologies, and changes to sowing times. World wheat yields have been increasing year by year since the 20th century. Under a 3.2°C scenario, yields would decline in low-latitude regions affected by higher temperatures, but those rising temperatures would result in increased yields in high-latitude regions, where low temperatures currently have a limiting effect. As a result, the average total world harvest would be likely to remain on a growth trend.*2 (Figure 3)

Fig. 3 Temperature Increase that would Start to Limit Wheat Yields in Different Locations (The end of this century: 2091-2100)



Based on our survey of multiple documents, including the forecast cited above, the Nisshin Seifun Group believes that there is little likelihood that climate change would result in major declines in wheat yields in key source countries in the medium-term future, since temperatures will not rise significantly under any of the climate change scenarios. However, when analyzing wheat procurement risks relating to climate change, we need to consider not only yield fluctuations, but also other factors, such as the impact of droughts on trade volumes, and quality deterioration. There is also considerable uncertainty about the long-term outlook for supply and demand and procurement prices for food, including wheat. We therefore believe that we cannot afford to disregard procurement risks, especially when looking to the long-term future, such as 2050. The Nisshin Seifun Group will continue to monitor the latest findings from related research, while taking action to mitigate and adapt to the impact of climate change, including collaboration with producers and research institutes on the development of new varieties

*1 Source: Food Security Office, Policy Planning Division, Minister's Secretariat, Ministry of Agriculture, Forestry and Fisheries, 2050 nen ni okeru sekai no shokuryo jukyu mitoshi [Outlook for World Food Supply and Demand in 2050] (September 2019) (based on the climate model used in the RCP 6.0 scenario in the IPCC's Fifth Assessment Report)

*2 Source: National Agriculture and Food Research Organization press release concerning the slowdown of growth in world cereal production due to climate change (https://www.naro.go.jp/project/results/4th_laboratory/niaes/2017/niaes17_s06.html)