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An early warning and decision support system to reduce weather and climate risks in agricultural production

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Abstract

Japanese agriculture has faced to several threats: aging and decrease of farmer population, global competition, and the risk of climate change as well as harsh and variable weather. On the other hands, the number of large scale farms is increasing, because farm lands have been being aggregated to fewer numbers of farms. Cost cutting, development of efficient ways to manage complicatedly scattered farm lands, maintaining yield and quality under variable weather conditions, are required to adapt to changing environments. Information and communications technology (ICT) would contribute to solve such problems and to create innovative technologies. Thus we have been developing an early warning and decision support system to reduce weather and climate risks for rice, wheat and soybean production in Japan. The concept and prototype of the system will be shown. The system consists of a weather data system (Agro-Meteorological Grid Square Data System, AMGSDS), decision support contents where information is automatically created by crop models and delivers information to users via internet. AMGSDS combines JMA's Automated Meteorological Data Acquisition System (AMeDAS) data, numerical weather forecast data and normal values, for all of Japan with about 1km Grid Square throughout years. Our climate-smart system provides information on the prediction of crop phenology, created with weather forecast data and crop phenology models, as an important function. The system also makes recommendations for crop management, such as nitrogen-topdressing, suitable harvest time, water control, pesticide spray. We are also developing methods to perform risk analysis on weather-related damage to crop production. For example, we have developed an algorism to determine the best transplanting date in rice under a given environment, using the results of multi-year simulation, in order to answer the question "when is the best transplanting date to minimize yield loss, to avoid low temperature damage and to avoid high temperature damage?". This work was partly supported by Council for Science, Technology and Innovation (CSTI), Cross-ministerial Strategic Innovation Promotion Program (SIP), "Technologies for creating next-generation agriculture, forestry and fisheries" (funding agency: Bio-oriented Technology Research Advancement Institution, NARO).

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