

주제-04

Rice Production in Japan - Status and Challenges with Diversified Concerns -Tatsuhiko Shiraiwa^{1*}¹Kyoto University

The society of Japan is experiencing progress of hyper aging, recent economic and financial difficulties, rapid progress of science and technology of genome, AI and IoT science, and climate change, etc. Crop production is of course essential for sustainable society. But the focus of agriculture has been diversified. In this presentation, I would like to argue some of the recent focusses and challenges in rice research.

Considering current status, Japanese rice culture has been well matured in terms of land productivity, palatability and for environmentally sound agriculture. The level of farmers' grain yield (over 6.5 t/ha in grain) is as high as 60 percent of the potential yield or 80 percent of the best experimental yields at research centers (Shiraiwa 2015). Cv. 'Koshihikari' remains one of the best quality varieties for a couple of decades, regardless of long intensive breeding for high quality rice. Since 1980s, crop management has been improved in terms of input-efficiency with social environmental concern and the efficiency of N fertilizer can be at most 80 percent in terms of up-taken N per unit fertilized N. Also, it has become common among farmers to minimize chemical use to control pests. In this situation, a challenge of rice research would be combining high palatability of commercial variety like 'Koshihikari' and productivity of high-yielding varieties like "Takanari" (*indica* var.). This is important to meet the demand for low-price and enough high-quality products and pressure for low cost and internationally competitive agriculture. Genetic factors have been identified for both eating quality and productivity, but it seems that understanding of mechanisms for productivity and quality is further required. For example, the high productivity of 'Takanari' is attributed to both source and sink formations and, even if only the source is targeted, a new physiological aspect for photosynthetic ability is being recognized in addition to high potential activity.

From the social point of view, the first concern would be decreasing and aging population participating in rice production. A majority of rice farmer is in their late sixties or older and the shortage of labor to sustain farms and farmlands will become further lacking, which is indeed serious for sustaining rural community and resources. This stimulated the wave of new mechanization of rice production called "smart agriculture" to reduce labor cost drastically. The smart agriculture employs auto-drive machines including tractor, combine and planter, auto-irrigation systems, field monitoring with UAV and sensors, farm management systems with CIT for every process of farms with hundreds of field plots. A large project by the government (2019 and 20109 is demonstrating/ disseminating various options of the "smart" technologies across the country. In this activity the progress of AI is strongly expected. Though it may take time to realize high cost performance, some technological items would certainly help agricultural activity in the mountainous regions.

As for climate change issue, frequent occurrence of extreme weather event threatens agricultural production, as well as increasing average temperature and atmospheric CO₂. The concentrated rainfall (with wind), heat wave and new pests have been reported to be severe and frequent. Development of taller and harder rice plant, for example, may help to cope with increased variation of water environment such as temporal flood. Since it has rarely been tackled, agronomical adaptation against short time and large variation of environment is a big challenge.

[Short resume]**Dr. Tatsuhiko SHIRAIWA**

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