

Forum on Future Food (Summary)

Forum Outline

On Saturday, September 29, 2018, “Forum on Future Food,” co-hosted by Tsukuba Plant Innovation Research Center, University of Tsukuba (T-PIRC) and Network for Breeding by Genome Editing was held at Hitotsubashi Auditorium, Hitotsubashi University. The objective of this forum was to discuss the applications of genome editing technologies in agriculture and food in Japan from a variety of perspectives, which agreed with CRISPRCon’s spirit of gathering a broad selection of diverse voices regarding the applications of genome editing technologies. To achieve this objective, an interactive system in which participants could instantly provide feedback was adopted in this forum. The total number of attendees at this forum was 225 including those from corporations (approximately 50%), universities/research institutions (approximately 30%), and others (media, government, producers, and consumers). The forum was a great success, starting with an opening address by Dr. Hiroshi Ezura, Director of T-PIRC and Chief Organizer of Network for Breeding by Genome Editing, and concluding with a closing speech by Dr. Yutaka Okumoto, Professor of the Graduate School of Agriculture, Kyoto University and President of the Japanese Society of Breeding. The following is an abstract of each program.

Session I Keynote speech

- **Keynote speech 1 Food in Japan from the viewpoints of global and Japanese agriculture—today and in the future**

The speaker was Dr. Koh-ichi Kadowaki, Vice-President of the National Agriculture and Food Research Organization (NARO). He emphasized the importance of sustainable development in agriculture which could address the problems caused by global population growth and unstable agricultural production due to slower growth of yields, climate change, fluctuating crop prices, etc. The problem of declining regional agriculture with low self-sufficiency for food in Japan was also introduced. Dr. Kadowaki explained the mission of NARO to contribute in overcoming such agricultural and food problems through research and development, along with the expectation for modern breeding technologies including genome editing technologies and the circumstances surrounding research and development.

- **Keynote speech 2 Challenges and expectations for Japanese food production and distribution**

The speaker was Ms. Kaori Miyake, Executive Officer of Aeon Co., Ltd. She explained the current situation of communication with consumers from the distributor’s point of view. According to her explanation, only 1% of inquiries about food from consumers were regarding genetically modified food and the majority of contents of such inquiries were concerns about uncertainty. Aeon placed emphasis on disclosure of known facts and easy-to-understand display of necessary information to alleviate consumer fears. However, she explained that the complicated Japanese supply chain with separate commodity distribution and commercial distribution is one of the challenges and there are difficult aspects to promote food traceability.

- **Keynote speech 3 Future state of food expected by consumers**

The speaker was Ms. Hisa Anan, Chief Director of the Association to Create a Society with Consumer Citizenship (ASCON). First, she introduced ASCON’s activity aiming to form a society with consumer citizenship, not through confrontation, but communication. She explained that what consumers expected in the future of food included safety, functions to maintain or enhance health, stable supply, sustainable production, promotion of research and development of new technologies, local production for local consumption, increase in global food production,

and cooperation with other countries. She also mentioned the importance of promoting SDGs of the United Nations. In order to achieve these expectations, true communication between consumers and corporations through dialogue is of utmost importance. It was emphasized that consumers' awareness of their responsibilities to society and the environment is also important because consumers have not only rights, but also responsibilities.

- **Panel Discussion**

Views regarding the communications among researchers, distributors, and consumers were exchanged in a panel discussion with the speakers of Session I as panelists and Dr. Ryo Ohsawa, Professor of the Faculty of Life and Environmental Sciences, University of Tsukuba as a moderator. Regarding information provided by researchers, the existence of a gap between the research findings and consumer needs was pointed out, along with the lack of continuity. Regarding this issue, the importance of pursuing both application research and basic research was explained, along with the fact that communication of information was left to the discretion of each researcher. As a whole, the participants agreed on the importance of recognizing the existence of a disparity in the amount of information among developers, distributors, and consumers as well as the importance of efforts for continuous communication by developers, conscious gathering of information by consumers, and bridging the gap between developers and consumers by distributors.

Session II Breakout sessions

- **Group 1 “How does the frontier of breeding technology relate to the view of future food we expect?”**

In this group, with moderators Dr. Tomiko Yamaguchi, Professor of the International Christian University and Dr. Yuki Sasakawa of NARO, the changes brought to our diet by application of latest genome editing technologies were discussed by the commentators Dr. Yutaka Tabei, Chief Scientist of NARO, Dr. Akira Komatsu, Senior Scientist of NARO, Ms. Mariko Ichikawa, President of the Food Communication Roundtable, Ms. Tomoko Natsume, Manager of the National Federation of Regional Woman's Organization, and Mr. Satoshi Koike, President & CEO of Vegetalia Inc., in the presence of approximately 70 attendees.

First, Dr. Tabei explained that the technology base of genome editing or genome editing breeding was nothing more than one of various breeding technologies. After that, Dr. Komatsu introduced examples of breeding by genome editing conducted at NARO, such as potato with low risk of food poisoning, sprouting resistant wheat, hypoallergenic soybean, and super high-yield rice.

The discussion facilitated vigorous exchange of views regarding the conflict or coexistence of consumer acceptance and social implementation of new technologies, based on the common understanding of consumer fears of the unknown. It was acknowledged that discussions including “actual products” and “recognizable benefits” were important, since most discussions starting from “technology” did not draw attention from consumers. The benefits expected by consumers included ease of preparation and consumption. On the other hand, producers had high expectations for technological innovation which solved the problems they were facing in the production field. There was an opinion that one of the challenges for producers was to inform consumers that they already benefited from technological innovations including genetic modification. The importance of the role of government and visionary in clarifying the benefits of technologies and promoting them was discussed, while consumers' responsibilities to form a society with consumer citizenship and to be aware of domestic and international challenges were explained.

The most voted for feedback after the completion of the session included “necessity of simplified regulations” and “introduction of this topic into education at school.”

Group 2 “Forefront of genome editing technology – R&D, intellectual property, and regulatory considerations”

In this group, which had approximately 100 attendees, the latest information on research and development, intellectual property, regulatory considerations and advancement of genome editing technologies overseas were shared.

First, Dr. Sakiko Hirose, Chief Scientist of NARO introduced the research results of genome editing technologies for agricultural crop development such as restriction reduction of mutation introduction sites by CRISPR/Cas9, base substitution using deaminase, and methods of supplying artificial restriction enzyme that were expected to improve future development and be applied to various crops.

Next, Mr. Kazunori Hashimoto, Patent Lawyer, Centcrest IP Attorneys, explained the current situation of basic patenting of genome editing technologies including CRISPR/Cas9. He also explained the business aspect of CRISPR/Cas9, including licensing policy and validity of patents in each country.

Professor Masashi Tachikawa of the Graduate School of Environmental Studies, Nagoya University explained how crops produced using genome editing technologies were handled in EU, the United States, Australia, New Zealand, Argentina, Brazil, etc.

The discussion was held by the speakers of this session and Professor Ezura of University of Tsukuba. First, the necessity of combining various technologies to produce actual crops was discussed and an example of applying for more than 10 patents in SIP (Cross-ministerial Strategic Innovation Promotion Program) of the Cabinet Office was reported. Regarding the validity of patents for crops, which was a major concern of many attendees, it was explained that the validity of patents for crops should be verified for each country because it varies in different countries. In addition, it was explained that differences in the area of regulation in relation to genome editing technologies in each country was a result of differences in legal definitions and concerns about safety risks were not involved in the decision to regulate genome editing technologies in a given country.

Approximately 70% of the attendees commented that their expectations toward genome editing technologies were heightened after the completion of the session. At the same time, many attendees had concerns about patent licensing procedures and the regulations in other countries and asked for continuous provision of relevant information.

● **Group 3 “Future Agriculture”**

In this group, views regarding the current situation, challenges, and future of agriculture were exchanged among commentators (producers and breeding company representatives), Professor Ryo Ohsawa (moderator), and approximately 50 attendees.

First, three commentators introduced their companies and business activities. Mr. Tomohiro Kondo, President of NIPPON NORIN SEED Co. explained, in addition to an introduction of the company, that it was important for breeding companies to provide both high quality seed (high germination rate) and excellent seed (yielding excellent product); therefore, breeding to meet the needs of the market was conducted by incorporating new technologies including marker breeding.

Mr. Takashi Sakaue, CEO of SAKAUE Farm, which gained attention as new form of farm management, introduced the farm management as a business corporation, as well as the three business domains of “crop production by contract,” “sales of grass to cattle farmers,” and

“consulting on introducing IT for farm management by self-developed systems” and explained that it was important to know how to react to ever changing demand.

Mr. Nagateru Nozawa, COO of MIRAI, which operates plant factories, introduced the changes in organization and business activities, along with the challenges faced by plant factories. He explained that breeding was important for plant factories because high quality species were important for stable cultivation of crops.

In a question and answer session with commentators, a wide range of topics covered included cultivar improvement and rights protection, management and human resources of farms as a business corporation, administration and operation of large numbers of leased plots, uniformity in cultivation at plant factories, and challenges and future perspectives regarding taste.

In the discussion that followed, some commented that even though the needs of consumers were important for agricultural production, breeding should be based on the needs of producers because the needs of consumers were changeable or could be unrealistic and there should be more opportunities for dialogue between the consumers and producers. In the heated discussion about the development of new varieties, some said that social acceptance should also be taken into consideration when developing new varieties, while some argued that what producers wanted was not varieties with added value, but a stable supply of seeds that could consistently produce high crop yields.

Session III Plenary panel discussion “How to utilize scientific technologies that support the future of food”

The speakers of Session I: Dr. Kadowaki, Ms. Miyake, and Ms. Anan and the panelists: Mr. Masami Kojima, Representative Secretary of Japan Food Journalist Association and Mr. Koike (commentator for Session II) exchanged views in a discussion regarding the title subject with Ms. Emi Gamo, Expert Advisor, Nippon Association of Consumer Specialists and Dr. Mieko Kasai, Professor, Center for Environment, Health and Field Sciences, Chiba University as moderators.

Following a report from each group of Session II by moderators, the panelists introduced themselves. Mr. Kojima gave a new perspective as a journalist in his speech titled “Issues surrounding genome editing technologies.” Using the fact that there are no protests against smart phones that are actually causing health problems in the younger generation as an example, he showed that those who benefited from the advantages of new technologies propelled their proliferation. He also raised issues that prompted reconsideration of conditions for social acceptance, including the relevance of risk communication as a measure to solve value conflicts and the necessity of solving such conflicts.

After that, Mr. Koike introduced his background and business lineup, which included application of various IT technologies like blockchain. He also explained the concept of information delivery from “farm to table” to convey the stories of producers to consumers.

Then, several questions were asked using the interactive system. Regarding the impression of “new scientific technologies,” 68% said they were “necessary to solve social problems.” However, regarding the impression of “new technologies ‘in the food field,’” the rate of favorable answer decreased to 49%, with an increase in the answer of “may solve social problems but causes problems” to 44%, showing an increased awareness of the issues concerning the food field.

In the discussion, some remarked that proactive delivery of information by producers and businesses was important to close the digital divide among consumers, producers, and businesses, while some pointed out that understanding by certain people who would become information sources was important because scientifically sound safety information was not

conveyed even by media and producers in many cases. Many panelists agreed on the importance of cooperation among researchers, producers, and businesses based on the disclosure of facts and evidence that each party possessed. After it was confirmed that it was important to continue to have discussions like this forum, in which information regarding genome editing technologies including safety evidence shown by many cohort researches; benefits to producers; maintenance of Japan's competitiveness in the international market; and contributions in solving international challenges including SDGs were shared by all parties involved, the forum concluded.

The questions and comments gathered through the interactive system included the most voted for comment of "Even if the safety of GM is shown in literature, it is not widely accepted. I would like to ask consumer groups what kind of safety should be shown for genome editing to be widely accepted," followed by "What is the reason for negative public reaction in Japan, while there is no scientific evidence (of danger)?," "What is the stance of Aeon?" and "It might not be necessary for everyone to understand the technology itself if the products become available first." Regarding the stance of Aeon, the reply given during the session stated: "The ability to responsibly explain the reason for the decision is important, but without the prospect of product distribution, we are not at the stage of discussion yet."