

JIRCAS Newsletter

for
INTERNATIONAL COLLABORATION



JIRCAS International Symposium 2016

Legumes Improve Our Livelihood! / 豆のちから、再発見

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Session chairpersons and symposium speakers

In This Issue

- 2 Foreword: International Year of Pulses and JIRCAS International Symposium 2016
- 3 JIRCAS International Symposium 2016 Program
- 4 Keynote Speeches
- 5 Session 1 Legumes in agriculture : Sustainability, environment, and development
- 6 Session 2 Legumes all over the world : Use of the diversity for improvement
- 7 Toward the development of soybean varieties resistant to rust disease
- 8 Session 3 Livelihood with legumes : Value addition and nutritional enhancement
- 9 Session 4 Panel Discussion: Contribution of legume research to the SDGs
- 10 JIRCAS TODAY

International Year of Pulses and JIRCAS International Symposium 2016

On December 2, we held the JIRCAS International Symposium 2016 titled “Legumes Improve Our Livelihood!” at the U Thant International Conference Hall of the United Nations University (UNU) in Tokyo. It was co-organized by the UNU Institute for the Advanced Study of Sustainability with tremendous support from the Research Council Secretariat of the Ministry of Agriculture, Forestry and Fisheries (MAFF, Japan), the National Agriculture and Food Research Organization (NARO, Japan), Japan Pulse Foundation, the Japan Liaison Office of the Food and Agriculture Organization (FAO) of the United Nations, and the Japan Forum on International Agricultural Research for Sustainable Development (J-FARD).

Beans possess excellent characteristics such as high nutritional value, good preservability, and tolerance to dry conditions, enabling it to support human diets since ancient times. Recognizing that beans play an important role in both food security and nutrition improvement, the United Nations declared 2016 as the “International Year of Pulses.”

Among us Japanese, we call soybeans, adzuki beans, and groundnuts/peanuts together as ‘beans.’ In contrast, its related English term ‘pulses’ (i.e., crops harvested for the dry seed such as cowpea) excludes soybeans and peanuts because they are also oil crops. Although this English classification had already been adopted by international organizations, we wanted to equally recognize the importance of ‘pulses’ such as red beans used in Japanese sweets and red rice, as well as ‘beans’ such as soybean, which is a raw material for miso, soy sauce, tofu, and *natto* or fermented soybean. JIRCAS is currently doing cowpea research in Africa, and we have long been involved in soybean cultivation in Brazil and elsewhere. Needless to say, it was decided that these crops should be featured in the symposium. However, the differences in classification and meaning were a bit discomfoting for us, so we used the term “legumes” instead in the symposium title to include both ‘pulses’ (e.g., cowpea) and ‘beans’ (e.g., soybeans and peanuts).

Keynote speeches were delivered by Dr. David Bergvinson, director general of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), who

presented ongoing bean research projects worldwide and the steps being taken to achieve sustainable development, and Dr. Kazumi Maeda, professor emeritus at Kochi University, who explained the relationship between beans and people and traced the etymology (or the history of words used to name or describe beans) and its deeply rooted connection with our lives.

Thematic sessions were held on topics concerning the cultivation, research, and utilization of beans in various regions of Japan, Asia, Africa, South America, and the world. Japanese sweets named “Dora-yaki,” a sponge cake stuffed with adzuki bean jam, were served (courtesy of Japan Pulse Foundation) during coffee breaks and the exchange of information and opinions was more active than usual.

In the panel discussion, Dr. Bergvinson was joined by Dr. Gretchen Neisler, director of the Center for Global Connections in Food, Agriculture and Natural Resources, Michigan State University, USA, and Dr. Robert Abaidoo of Ghana, a professor of Kwame Nkrumah University of Science and Technology, Ghana. They talked and exchanged opinions on how research on legumes and pulses can contribute to the UN Sustainable Development Goals (SDGs).

Beans, or ‘*mame*’ as it is locally called, have brought color and richness to our lives since prehistoric times. As Professor Maeda mentioned in his keynote address, beans were transported through the Silk Road, hence we may also call this trade route the ‘Bean Road.’ Although the “International Year of Pulses” is already officially over, we are fully convinced that incorporating beans into our lives is good for health and nutrition. At the same time, we get to feel a piece of history as beans remind us of a time when they ‘walked’ with humankind.



Dr. Kunihiko Doi



Dr. Satoshi Tobita



Various bean specimens (courtesy of Japan Pulse Foundation)



Bean samples (JIRCAS)

Kunihiko Doi
Director
Research Strategy Office

Satoshi Tobita
Program Director
Environment and Natural Resource Management Program

JIRCAS International Symposium 2016

Legumes Improve our Livelihood!

Date : December 2, 2016

Venue : U Thant International Conference Hall,
United Nations University, Tokyo, Japan

Program

Opening Ceremony

Opening Remarks

Masa Iwanaga (President, JIRCAS)

Welcome Address

Masamichi Saigo (Director General, Agriculture, Forestry and Fisheries Research Council Secretariat, MAFF)

Welcome Address

Kazuhiko Takemoto (Director, Institute for the Advanced Study of Sustainability, United Nations University)



Dr. Masa Iwanaga



Dr. Kazuhiko Takemoto



Mr. Masamichi Saigo

Keynote Speeches

Chair : Kunihiro Doi (Director, Research Strategy Office, JIRCAS)

Potential of legumes : Global needs and challenges

David Bergvinson (Director General, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT))

The acceptance of soybean and groundnut into southeast Asia – From “10,000 years history of legumes and man”

Kazumi Maeda (Professor Emeritus, Kochi University)

Session 1 Legumes in agriculture:

Sustainability, environment, and development

Chair : Satoshi Tobita (Director, Environment & Natural Resource Management Program, JIRCAS)

An overview of legume cultivation in Japan

Makita Hajika (Director, Field Crop Research Division, Institute of Crop Science, NARO)

Legume-based cropping systems for improving soil environments in sub-Saharan Africa

Robert Abaidoo (Professor, Kwame Nkrumah University of Science and Technology, Ghana)

Impact pathways of legumes: Increasing bean productivity and nutritional quality of family diets in the Western Highlands of Guatemala

Gretchen Neisler (Director, Center for Global Connections in Food, Agriculture and Natural Resources, Michigan State University, USA)

Session 2 Legumes all over the world:

Use of the diversity for improvement

Chair : Kazuo Nakashima (Director, Stable Agricultural Production Program, JIRCAS)

Importance of pulses research in India: Chickpea and pigeonpea

Girish Prasad Dixit (Project Coordinator, Indian Institute of Pulses Research, India)

Domestication genes and stress adaptation genes in the genus *Vigna* for sustainable agriculture under stress environments

Norihiko Tomooka (Genetic Resources Coordinator, Genetic Resources Center, NARO)

Toward the development of soybean varieties resistant to rust disease

Naoki Yamanaka (Senior Researcher, JIRCAS)

Session 3 Livelihood with legumes:

Value addition and nutritional enhancement

Chair : Yukiyo Yamamoto (Director, Value-Adding Technologies Program, JIRCAS)

Contribution of legumes to smallholder agriculture and livelihood sustenance in sub-Saharan Africa: Evidence from Malawi, Ghana, and Guinea

Yaw Agyeman Bofo (Integrated Research System for Sustainability Science, The University of Tokyo)

Linda Chinangwa (United Nations University Institute for the Advanced Study of Sustainability)

Boubacar Siddighi Balde (Integrated Research System for Sustainability Science, The University of Tokyo)

Nutritional improvement of children in Africa using soybean as a major protein source

Yasuhiko Toride (Director, R&D Planning Department, Ajinomoto Co. Ltd., Japan)

Beans & pulses in the world

Kiyomi Hasegawa (President, Beniyabis, Beniya Hasegawa Store, Japan)

Session 4 Panel Discussion

Moderators

Kunihiro Doi and Satoshi Tobita

Panelists

David Bergvinson, Robert Abaidoo, Gretchen Neisler

Closing Ceremony

Closing Remarks

Osamu Koyama (Vice President, JIRCAS)



Dr. Osamu Koyama

Keynote Speeches

Two distinguished guest speakers delivered their lectures at the JIRCAS International Symposium 2016. The first speech, titled “Potential of legumes: Global needs and challenges,” was given by Dr. David Bergvinson, director general of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), which is one of the research centers of the Consultative Group of International Agricultural Research (CGIAR). The second speech, titled “The acceptance of soybean and groundnut into southeast Asia – From 10,000 years’ history of legumes and man,” was delivered by Dr. Kazumi Maeda, professor emeritus at Kochi University.

Dr. Bergvinson began the first speech by saying that enhancing public awareness on the contribution of pulses to modern food systems was the intent of the 68th UN General Assembly for declaring 2016 as the International Year of Pulses. He emphasized the importance of grain legumes in providing an opportunity to ensure nutritional security and enhance farmers' income and profitability through increased demand in both developing and developed regions. Having said that, he also noted that despite its importance as viewed from different perspectives, the adoption of improved production technologies for pulse crops has been slow. He mentioned that their average production has been very low so it cannot meet demand, leading to price volatility especially in developing countries.

Dr. Bergvinson later said that the aim of the 10-year CGIAR Research Program on Grain Legumes (CRP-GL) is to combat poverty, hunger, malnutrition, and environmental degradation by increasing productivity, profitability, and consumption of grain legumes. He also explained that the program is targeting research and development in eight major food legumes primarily grown by smallholder farmers. Recognizing the recent advances in modern tools for breeding, agronomy, and market integration, he stated that it is now possible to unlock the full potential of grain legumes to support the realization of the Sustainable Development Goals.

Dr. Maeda began the second speech by showing that legumes are highly diverse, and he expressed this in terms of the wide variation in seed size, shape, color, and pattern. Then, while talking about the origins of legume domestication and secondary dispersals, he explained the term “agricultural complex,” which illustrates the parallel development of major legume crops with cereals and root tubers in these regions of the world. He also presented his study on the names of legumes in the Indo-China Peninsula



Dr. David Bergvinson (International Crops Research Institute for the Semi-Arid Tropics)



Dr. Kazumi Maeda (Kochi University)

and Southeast Asia, classifying them into three main groups (i.e., *kacang*, *dau*-, and *kedele*-) and signifying that these names and geographic distribution implied the propagation routes and times of acceptance.

Dr. Maeda further explained that throughout the 10,000-year history of farming, many legume crops have been adopted in traditional cropping systems and that these plants have played an important role in maintaining soil fertility. He also said that legumes are highly nutritious, that the mature dried seeds maintain long-term storability and viability, and that they are consumed in many ways, not only as dried seeds, green vegetable pods, and bean sprouts but also as fermented products. He concluded by expressing hope that a Green Revolution in leguminous crops will come true in the near future through the work of young scientists.

Sakiko Shiratori
Research Strategy Office

Session 1 Legumes in agriculture: Sustainability, environment, and development

Legumes or pulses are important crops in world agriculture. Food legumes comprise a higher ratio in the diets of people in developing countries than in developed regions, and leguminous crops contribute to the sustainability of agricultural environments in traditional cropping systems. Several rural development and human nutrition improvement projects have already been implemented through legume-based interventions. For this session, three speakers were invited to report on the agricultural situation with regard to legumes.



Chair: Dr. Satoshi Tobita (JIRCAS)

First, Dr. Makita Hajika, director of Field Crop Research Division, Institute of Crop Science, National Agriculture and Food Research Organization (NARO), Japan, gave an overview of legume cultivation in Japan. He said that although legume production is merely 4% of total Japanese agricultural production, the presence of legumes in Japanese food life is not small, with soybean as the source of miso, tofu, etc. and adzuki as an essential material in making Japanese sweets. He emphasized soybean's importance by the fact that it occupies three-fourths of both legume cultivation area and production volume. However, problems such as weather disasters, pest damage, and waterlogging have emerged with the expansion of cultivation areas. Legumes are also important as vegetable crops, particularly green soybean (edamame), snap peas (saya-endou), and green peas. He also introduced research activities on cultivation and breeding of legumes that can adapt to diverse agricultural environments in Japan.



Dr. Makita Hajika (NICS, NARO)

Next, Dr. Robert Clement Abaidoo, a professor at the Kwame Nkrumah University of Science and Technology (KNUST), Ghana, gave an overview of several low-fertility soil types spread across Sub-Saharan Africa. Then he described two projects in SSA that aimed to improve soil fertility through legume cultivation. He explained that the first case study, the N2Africa Project, aims to utilize nitrogen from the atmosphere to spur plant growth through

biological nitrogen fixation (BNF) of leguminous crops for resource-poor local farmers, and that effective N-fixing rhizobial strains were selected and affordable inoculation techniques were developed and disseminated in 8 states of SSA. He reported that the project has been successful as farmers' income increased by 15% after nearly doubling the yield of soybean and cowpea. He briefly mentioned the second case study, and he presented scenarios on how to stop soil nutrient depletion and realize positive N balance in farmlands within the savanna areas. This, he said, can be achieved through legume introduction and the retention of haulm (stems or stalks) in the farm.



Dr. Robert Clement Abaidoo (KNUST, Ghana)

Finally, Dr. Gretchen Neisler, director of the Center for Global Connections, Michigan State University (MSU), USA, talked about the success story of Másfrijol ("more beans" in Spanish) Project, which is being implemented in the western highlands of Guatemala, Central America. She said that the Legume Innovation Laboratory of MSU, the main actor of this project, employs a new approach that promotes dry bean consumption through training and education of consumers, especially women in the target area, with the expectation that it will lead to good dietary decision making at household levels. She further explained that the impact pathway is unique and complex and can be established through active social implementation, starting from the dissemination of research outputs to develop a new bean variety with better adaptability to such high-altitude environments, to the realization of activities to improve the nutritional status of children under 5 years old.



Dr. Gretchen Neisler (MSU, USA)

Satoshi Tobita
Program Director
Environment & Natural Resource Management Program

Session 2 Legumes all over the world: Use of the diversity for improvement

Legumes including soybean are important food resources. We at JIRCAS conduct researches aimed at developing technologies for stable agricultural production in the tropics and other adverse environments. We promote researches related to the evaluation and utilization of cowpea genetic resources, and the development of soybean varieties that are tolerant to adverse environments. In promoting these researches, it is important that the global research situation on the evaluation and utilization of legume genetic resources are known and discussed. Hence, for this session, we invited three researchers who are actively engaged in the study and use of genetic resources to improve the quality and production of edible legumes.

Dr. Girish Prasad Dixit, a project coordinator of the Indian Institute of Pulses Research, India, delivered a presentation entitled "Importance of pulses research in India: chickpea and pigeonpea." India has the second largest population in the world with 1.3 billion, about half of which



Chair: Dr. Kazuo Nakashima (JIRCAS)



Dr. Girish Prasad Dixit (Indian Institute of Pulses Research)



Dr. Norihiko Tomooka (Genetic Resources Center, NARO)

is vegetarian. Therefore, legumes, especially chickpea and pigeonpea, are important sources of protein in India. Dr. Dixit introduced some research topics on the utilization of chickpea and pigeonpea genetic resources, namely, increase of production; improvement of tolerance to high temperature and drought; provision of pest resistance by genetic transformation; and marker-assisted breeding of drought tolerance, etc. He also discussed the current research situation regarding chickpea and pigeonpea in India.

Dr. Norihiko Tomooka, a genetic resources coordinator of the Genetic Resources Center, National Agriculture and Food Resources Organization (NARO), Japan, gave a lecture entitled "Domestication genes and stress adaptation genes in the genus *Vigna* for sustainable agriculture under stress environments." The genus *Vigna* includes cultivated species such as cowpea, adzuki bean, and mung bean. Moreover, the diversity of the wild species of *Vigna* is prominently high among leguminous plants, thus they can adapt to various environments. Dr. Tomooka's very impressive presentation talked about these wild species and its high environmental adaptability, and he explained the recently discovered genes associated with domestication and stress adaptation. Furthermore, he proposed a new breeding strategy via "neo-domestication" of wild plant species to enable sustainable agriculture even in adverse environments.

Dr. Naoki Yamanaka, a senior researcher of JIRCAS, Japan, presented his topic entitled "Toward the development of soybean varieties resistant to rust disease" (Details are in the next article). His lecture offered hope that soybean production will be stabilized through the use of new rust-resistant varieties.

There was a vigorous exchange of opinions after each Q and A following the presentations. Questions were raised particularly on the possibility of a trade-off, i.e., whether the introduction of tolerance genes against adverse environments will impair seed yield or quality; the function of the genes found; and future prospects for breeding, among others.

In this session, we were able to recognize and reaffirm the usability, diversity, and environment adaptability of legumes. We would like to use it to further promote legume breeding research through utilization of genetic resources toward achieving stable agricultural food production in the world.

Kazuo Nakashima
Program Director
Stable Agricultural Production Program

Toward the development of soybean varieties resistant to rust disease

Soybean is highly important to the Japanese as it is widely used in producing traditional soy foods as well as soybean oil. However, the domestic demand for soybean is mostly met by imports from other countries. Therefore, it is quite important for us to ensure stable soybean production in countries that supply large amounts of soybean to the world market. Brazil, Argentina, and Paraguay in South America produce more than half of soybean in the world market. However, soybean grown in the tropical and subtropical regions of these countries face challenging problems. The Asian soybean rust (ASR), a soybean disease caused by *Phakopsora pachyrhizi*, has been identified as one of the most serious threats to soybean growers together with drought. To address this problem, JIRCAS has been carrying out collaborative researches on the development of ASR-resistant cultivars with our partner institutions in South America for more than 10 years.

Firstly, we developed a reliable method for evaluating ASR resistance in soybean and surveyed the virulence of ASR pathogen in South America. Our results reveal that the virulence of the South American ASR pathogen is very strong and highly diverse. Therefore, a resistant cultivar carrying stable ASR resistance cannot be expected by simply introducing a single known major ASR resistance gene. Secondly, we developed soybean breeding materials and tools that are useful in South America. Specifically, we have identified resistance genes/alleles in the ASR-resistant soybean genotypes whose resistance genes/alleles

were unknown. We have also identified DNA markers for newly and previously identified resistance loci to easily and accurately detect the presence of resistance genes. Furthermore, we developed and evaluated soybean breeding materials carrying multiple ASR resistance genes.



Through these works, it appears that introducing multiple resistance genes into a single soybean genotype brings high ASR resistance. This high resistance also acts synergistically in gene-pyramided soybean lines when they are inoculated with *P. pachyrhizi* races that are virulent to each of the pyramided genes (Fig. 1). JIRCAS and our partner institutions in South America have carried out some marker-assisted breeding programs to introduce this high ASR resistance in South American soybean cultivars by utilizing the gene-pyramided lines (Fig. 2). Elite soybean cultivars carrying high resistance and stability against ASR will contribute to increased and stabilized soybean production, higher profitability for the farmers by reducing both yield losses and huge control costs, and decreased burden for the environment through fungicide use.

Naoki Yamanaka
Biological Resources and Post-harvest Division

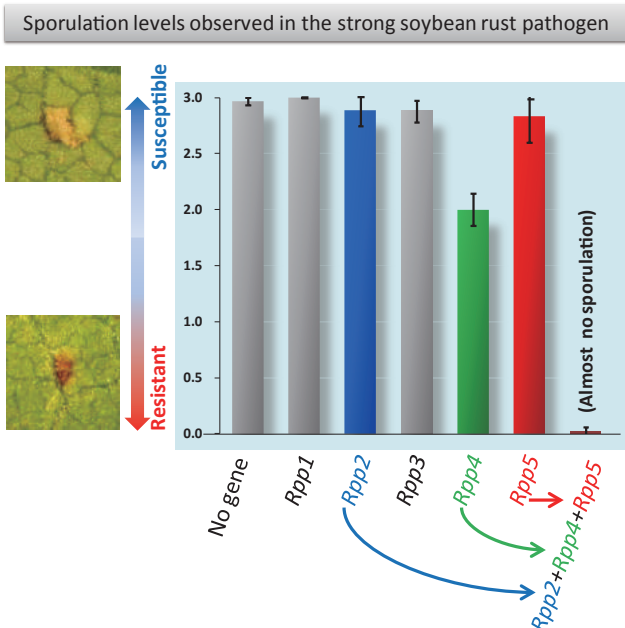


Fig. 1. Sporulation levels observed in the strong soybean rust pathogen. The resistance levels of a susceptible variety, 5 resistant varieties each carrying a single resistance gene (*Rpp*), and a gene-pyramided line carrying 3 resistance genes were compared to their sporulation levels.

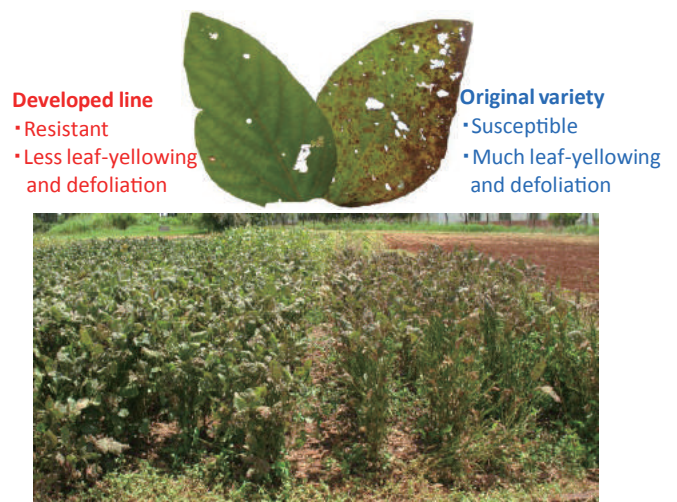


Fig. 2. ASR-resistant line developed by utilizing the gene-pyramided line in Paraguay (left) and the original variety carrying no resistance gene (right)

Session 3 Livelihood with legumes: Value addition and nutritional enhancement



Chair: Dr. Yukiyo Yamamoto (JIRCAS)

Many kinds of legumes are cultivated all over the world, and they are introduced into the dietary habits and traditional cultures of each region. Pulses and legumes are important in our lives. Hence, in Session 3, we focused on their roles and utilization, and showed some examples both domestically and internationally.

Dr. Yaw Agyeman Bofo, a project researcher of the Integrated Research System for Sustainability Science (IR3S), The University of Tokyo, discussed the contribution of legumes to smallholder agriculture and food security in Sub-Saharan Africa, with examples from Malawi, Ghana, and Guinea. In these countries, groundnuts are dominant and important for both subsistence and cash cropping. Dr. Bofo also mentioned that improvement of productivity, utilization of various legumes including indigenous varieties, and enhancement of market access are necessary to increase legume production in Sub-Saharan Africa.



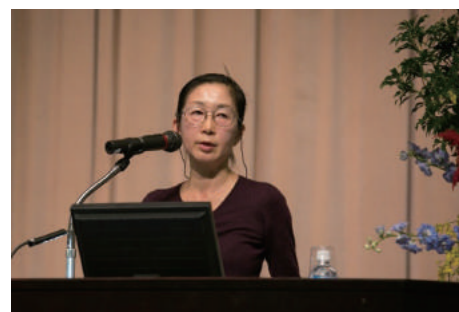
Dr. Yaw Agyeman Bofo (IR3S, University of Tokyo)

Dr. Yasuhiko Toride, senior advisor at Ajinomoto Co., Ltd., talked about improving the nutritional status of children in Africa using soybean as the major protein source. Ajinomoto Co., Ltd. has developed the nutritional supplement “KOKO Plus,” which contains soybean powder and amino acids (e.g., lysine), and verified its effectiveness in improving children’s growth and health conditions through some pilot studies implemented in Ghana. Furthermore, he introduced a newly developed “Ready to Use Therapeutic Food (RUTF)” composed of soybean, maize, and sorghum.



Dr. Yasuhiko Toride (Ajinomoto Co., Ltd.)

Ms. Kiyomi Hasegawa, president of Beniya Hasegawa Store, introduced various indigenous varieties and explained the role of pulses and beans in global food cultures, including Japan’s. She visited 43 countries and interviewed people, including farmers and diners, and described her experiences about locally used beans and traditional recipes. She produced interesting results concerning bean varieties and food cultures, and her lecture was heightened visually with beautiful pictures. In the discussion following her presentation, she recalled coming across *natto*-type sticky beans in Burkina Faso and Benin, similar to those found in Japan. She also suggested that the empowerment of women and small communities is important for the preservation and utilization of local bean species.



Ms. Kiyomi Hasegawa (Beniya Hasegawa Store)

There are various kinds of beans in the world. For instance, we have soybeans, kidney beans, and sweet peas, which are well known to the Japanese; pigeon peas, cowpeas, and groundnuts, which are widely cultivated in many regions; and indigenous varieties, which are used traditionally. They contribute to the establishment of regional food cultures and help ensure a stable nutrient supply. Thus, through Session 3, we were able to reaffirm the benefits that beans bring to our lives, learn about new utilization of bean varieties, and recognize its future potential.

Yukiyo Yamamoto
Program Director
Value-Adding Technologies Program

Session 4 Panel Discussion: Contribution of legume research to the SDGs

As highlighted in the opening remarks by Dr. Masa Iwanaga, president of JIRCAS, and Mr. Masamichi Saigo, director general of the Agriculture, Forestry and Fisheries Research Council Secretariat, MAFF, Japan, the year 2016 marked the International Year of Pulses (IYP) and the start of the global drive for actions on the Sustainable Development Goals (SDGs) of the 2030 Agenda. Therefore, to commemorate the IYP and exchange viewpoints on how research on legumes/pulses can contribute to the SDGs, a panel discussion was conducted towards the end of the symposium. Drs. David Bergvinson (ICRISAT), Robert Abaidoo (KNUST, Ghana), and Gretchen Neisler (Michigan State University), all of whom have solid experience in research and development (R&D), graciously participated as panelists, while Drs. Kunihiro Doi and Satoshi Tobita of JIRCAS facilitated the session as moderators.

Prior to the panel discussion, the previous sessions were briefly outlined as follows: 1) Long and mutual history of man and legumes, 2) Power of legumes, and 3) Research activities to utilize the full potential of legumes. Afterwards, the theme of the panel discussion was described with a few slides, and the panelists were requested to articulate their ideas and views on the contribution of legume research to the SDGs. First, Dr. Bergvinson explained that 11 out of 17 SDGs can be linked to legumes and legume research, and that the 17th goal (i.e., global partnership), would be most important in evaluating the acceptance and impact of research outcomes on legumes/pulses. Next, Dr. Abaidoo mentioned that since most of the symposium speakers had already given insights into the above-ground part of legumes, he would give his own perception on the significance of legume research toward soil health and land sustainability in connection with the 12th and 13th

SDGs. Lastly, Dr. Neisler stated that research should be scientifically relevant and reasonable so as to have positive impacts on the SDGs, and that researchers should have a benchmark to measure the impacts. She also said that the effectiveness of legume research would depend on the delivery of the end products and its wide adoption by the beneficiaries.

The panelists were then asked their opinions about ‘inclusiveness’ in legume research, which is one of the concepts behind the action plan for the SDGs. Dr. Bergvinson said that consumers as well as stakeholders should spread awareness of the environmental footprint. Dr. Abaidoo, in addition, suggested a new approach in legume research, one that allows farmers to become involved in the process so that the so-called language gap between researchers and farmers is reduced, thereby improving the smooth adoption of research outputs based on sufficient scientific evidence.

For the last discussion point, a question was posed regarding the highest priority research areas that can contribute to achieving the SDGs. Although the decision-making process among smallholder farmers was raised, it was emphasized that researchers should know the extent to which the research outputs would be socially implemented. In the end, all the panelists agreed that in order to achieve the SDGs within 14 years, scientists and researchers must set a clear path in their research and development activities.

Satoshi Tobita

Program Director

Environment & Natural Resource Management Program



Moderators: Dr. Kunihiro Doi and Dr. Satoshi Tobita (JIRCAS)



Panelists: Dr. David Bergvinson (ICRISAT, India HQ), Dr. Robert Abaidoo (KNUST, Ghana), and Dr. Gretchen Neisler (MSU, USA)

JIRCAS TODAY

○2016 Japan International Award for Young Agricultural Researchers

JIRCAS, in cooperation with the Agriculture, Forestry and Fisheries Research Council (AFFRC) Secretariat, presented the Japan International Award for Young Agricultural Researchers for the tenth consecutive year. The award recognizes and honors young foreign researchers (under 40 years of age) who are highly recommended by their institutes, and whose outstanding achievements promote research and development of agricultural, forestry, fishery and other related industries in developing regions. The 2016 commendation ceremony was held last December 1 at the U Thant International Conference Hall, United Nations University (UNU) in Tokyo.

The awardees and guests were welcomed by Mr. Yoshio Kobayashi, chairman of the AFFRC. Congratulatory remarks were delivered by Mr. Hiroshi Chishima, director

for Industrial Technology and Nanotechnology, Bureau of Science, Technology and Innovation, Cabinet Office; Dr. Kazuhiko Takemoto, director of the UNU Institute for the Advanced Study of Sustainability; and Mr. Hiroto Mitsugi, director general of the Rural Development Department, Japan International Cooperation Agency (JICA). The selection process was explained by Dr. Mutsuo Iwamoto, chairperson of the Selection Committee. Mr. Kobayashi and Dr. Masa Iwanaga, president of JIRCAS, presented the prizes.

The selection process was conducted by a seven-member selection committee through a document review, with the chairman of the AFFRC determining three winners from among 25 candidates. Each awardee received a testimonial and a monetary prize of 5,000 US dollars.



Remarks by Mr. Yoshio Kobayashi



Congratulatory Remarks by Mr. Hiroshi Chishima



Congratulatory Remarks by Dr. Kazuhiko Takemoto



Congratulatory Remarks by Mr. Hiroto Mitsugi



Selection of Process Report by Dr. Mutsuo Iwamoto



Presentation of Prizes by Dr. Masa Iwanaga and Mr. Yoshio Kobayashi



Awardees, members of the selection committee, and other officials

The 2016 awardees and their research achievements are as follows:

◇ **Production of Vermicompost and Vermiwash Bio-fertilizers from Food Waste**



Awardee: Dr. Musaida Mercy MANYUCHI

Nationality: Republic of Zimbabwe

Institute: Harare Institute of Technology

Outline of Research Achievements:

Food and agricultural waste is being generated in huge quantities and in most cases are being left to rot, resulting in increased greenhouse gas emissions. However, these food wastes have the potential to be vermicomposted to produce biofertilizers in solid (vermicompost) and liquid form (vermiwash). During vermicomposting, the earthworms feed on the food waste and excrete them as fertilizers.

◇ **Novel Approaches for the Improvement of Yam Germplasm Conservation and Breeding**



Awardee: Dr. Gezahegn Girma TESSEMA

Nationality: Federal Democratic Republic of Ethiopia

Institute: International Institute of Tropical Agriculture (IITA)

Outline of Research Achievements:

Regardless of the huge benefit yam is offering to humankind and its wide distribution and cultivation, the crop has been neglected and treated as an orphan crop. Evidently, minimal efforts have been done to support conventional taxonomic identification to understand the taxonomy of yam. Moreover, the extent of genetic diversity has not been well investigated. In addition, very little is known regarding which genes are responsible for key traits in yams and

there is almost no report on polyploidy and its effect on phenotypic performance.

The research achievements addressing these gaps include the establishment of a DNA barcoding system that supports conventional taxonomic identification, understanding the extent of genetic diversity among cultivated guinea yams and wild relatives based on next-generation sequencing based genotyping techniques, understanding the effect of polyploidy on aerial tuber production, and the discovery of novel candidate genes implicated in flowering and sex determination.

◇ Precision Food Processing: Establishment of Mathematical Models for Microbiological and Physicochemical Food Properties for Food Safety, Food Defense, and Food Quality



Awardee: Dr. Alonzo Alulod GABRIEL

Nationality: Republic of the Philippines

Institute: University of the Philippines Diliman

Outline of Research Achievements:

The application of traditional yet effective and affordable thermal pasteurization process to thermosensitive raw materials such as fruit juices results in quality deterioration of the finished product. Therefore, the establishment of a thermal process schedule with the recommended lethality against disease-causing microorganisms, without the undesirable quality changes, is necessary to comply with consumer demand for safety and quality. One significant limitation of thermal processing is the dependence of its efficacy

on variations in the characteristics of raw materials, processes, and microorganisms. Therefore, a specific food commodity should have a unique process schedule; otherwise, underprocessing might compromise food safety, whereas overprocessing might result in an unacceptable commodity.

‘Precision Food Processing’ involves the establishment of process schedules, taking into consideration the specific food, process, and target organism characteristics. In this set of studies, a specific target microorganism was first determined, after which a predictive model for its thermal inactivation rates was established. The model-predicted inactivation rates together with food- and process-related variables were then used to establish a new set of predictive models that estimate deterioration in the Vitamin C, color, and consumer acceptability scores of heat-treated juices. These food safety and food quality models can be used simultaneously to estimate the efficacy of a thermal process schedule against the target organism and the effect of the process schedule on the overall quality of the finished product.

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