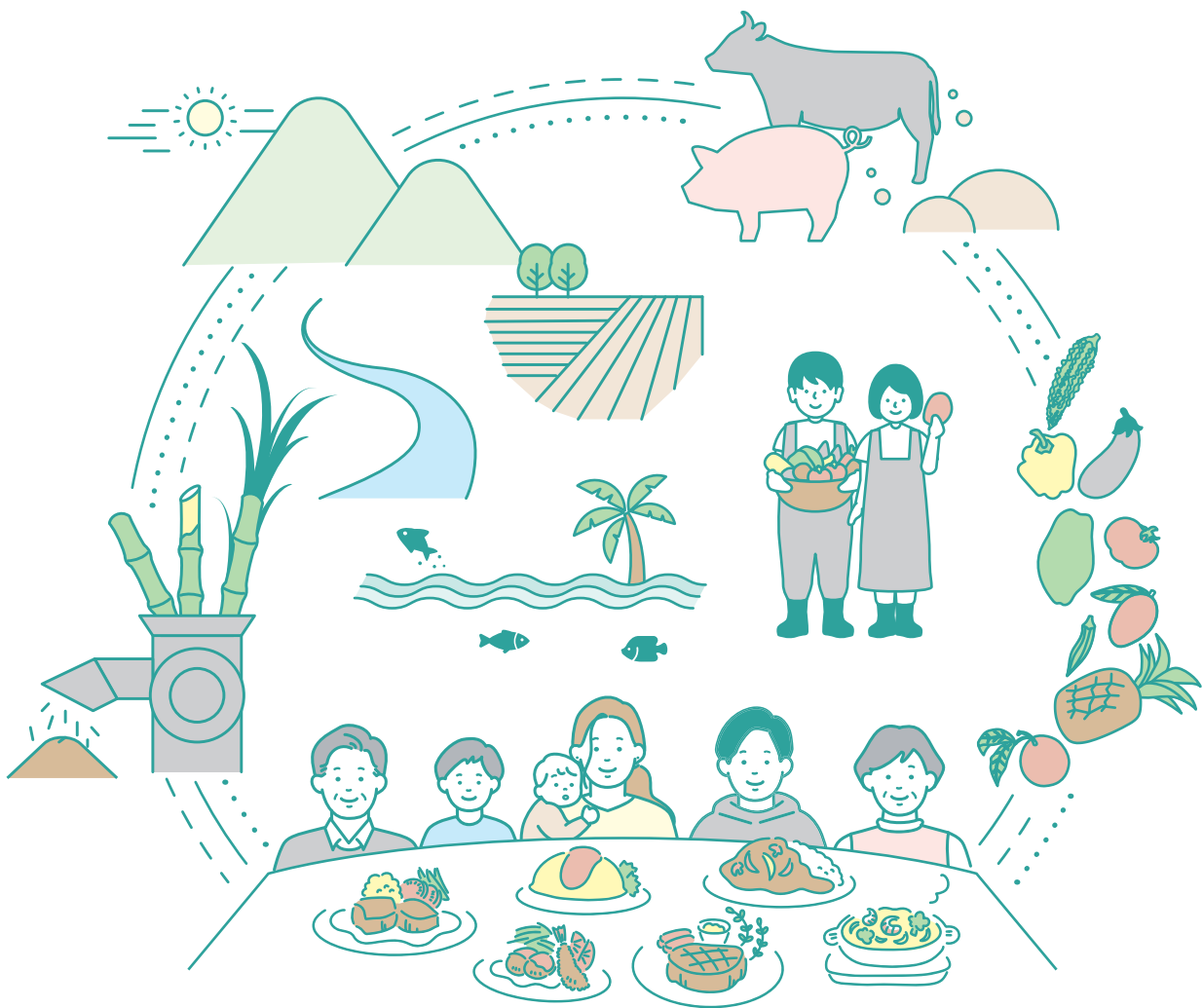


Seminar
Report

The forefront of Agricultural Research to Promote Resource Recycling on a semi-tropical island, Ishigaki, Japan

Presenting research activities on resource-recycling agriculture



Ishigaki City

This leaflet is to introduce JIRCAS actions to strengthen the collaboration among the producers, governments, academia, and civil society toward promoting resource-recycling technology for agriculture. We are also willing to contribute to building a sustainable society in the Philippines through our research and collaboration.

Messages from the seminar organizers

Hide OMAE Director, Tropical Agriculture Research Front,
JIRCAS

The prices of chemical fertilizers and compound feeds are soaring, and food prices are rising due to various international factors. The agricultural sector is facing multiple challenges, such as large-scale natural disasters, global warming, and a decrease in the number of agricultural producers, which are not only a challenge for Japan as a whole but also a serious issue here on Ishigaki Island. In response to these challenges, the Ministry of Agriculture, Forestry and Fisheries, Japan (MAFF) developed the Sustainable Food Systems Strategy "MeaDRI" in 2021, which aims to achieve both productivity improvement and sustainability in the food, agriculture, forestry, and fisheries industries through innovation. The strategy aims to reduce chemical fertilizers' use by 30%, increase the area devoted to organic farming, and eliminate carbon dioxide emissions.

This seminar focuses on resource recycling in agriculture. Ishigaki Island is rich in organic resources such as sugar residue and compost. Research institutions, including JIRCAS, have been conducting experimental research to utilize such resources.

In this seminar, we will present the outline of MeaDRI, the usefulness of resource-recycling agriculture using organic resources, and other related agricultural research. This meeting will provide an opportunity to learn more about resource-recycling agriculture and think together toward the sustainable development of agriculture on Ishigaki Island.



Nagatake TANAHARA Executive Director, Department of Agriculture, Forestry, Fisheries and Commerce, Ishigaki City

Ishigaki produces agricultural commodities by taking advantage of the climate, cultivation environment, and value-added Ishigaki-Island brand. The city's agricultural output in the fiscal year 2019 was 2.69 billion yen, mainly from sugarcane, followed by pineapple and paddy rice. Also, Ishigaki is certified as the focal production area of okra, pineapple, heliconia, and red ginger and has attracted attention from all over Japan.



<Read by Hideki MATSUKAWA, Director, Agricultural Policy and Economics Division>

However, we face challenges, including the aging of the farming population, lack of successors, an increase in idle farmland, and the need for cooperation between cropping and livestock farming using livestock manure. The soaring prices of fertilizers due to the high costs of crude oil and commodities, in combination with the weak yen and the crisis in Ukraine, are posing critical issues for agriculture. We are currently taking various measures to solve those issues.

This seminar is titled "The forefront of Agricultural Research to Promote Resource Recycling." Now we have the national strategy "MeaDRI", we will have a shift moving to resource-recycling agriculture. It is meaningful that the research institutions show the research outcomes to agricultural producers to solve the issues faced by the city's agricultural industry.

Last but not least, I would like to thank JIRCAS for holding the seminar with us. Hoping this seminar will lead to the development of the agriculture industry in Ishigaki City.

Presenters and presentation list



Co-host:
Ishigaki City

The forefront of Agricultural Research to Promote Resource Recycling on a semi-tropical island, Ishigaki, Japan

- 13:30 **Opening Remarks**
Hide OMAE
Director, Tropical Agriculture Research Front, JIRCAS
Nagatake TANAHARA
Executive Director, Department of Agriculture, Forestry,
Fisheries and Commerce, Ishigaki City
- 13:40 **Keynote Speeches**
(1) JIRCAS research activities to contribute to Ishigaki
Island and the national strategy “ MeaDRI”
Keiichi HAYASHI Program Director, Environment Program,
JIRCAS
(2) Effectiveness and Necessity of Circular Agriculture:
Toward Establishment of Sustainable Food Systems
Sadao EGUCHI Senior Principal Scientist, Institute for
Agro-Environmental Sciences, National Agriculture and
Food Research Organization (NARO)
(3) Experimental Research in Okinawa Prefecture: Aiming
for Sustainable Agriculture in Okinawa
Moritoshi TAMAKI Branch Director, Ishigaki Branch,
Okinawa Prefecture Agricultural Research Center
- 14:40 **Lectures**
(1) Development of Sugarcane Production Technology with
Utilizing Organic Resources in Ishigaki Island and Deep
Planting Cultivation
Yoshifumi TERAJIMA Senior Researcher, JIRCAS
(2) The Function of Living Organisms in the Soil in
Agricultural Land
Miwa ARAI Researcher, JIRCAS
(3) Fertilizer Application Model Using Organic Materials
Rie HOSOKAWA Senior Researcher, Okinawa Prefecture
Agricultural Research Center
- 15:45 **Panel Discussion**
- 16:25 **Wrap-up & Closing Remarks by HAYASHI Keiichi**
- 16:30 **Closing**

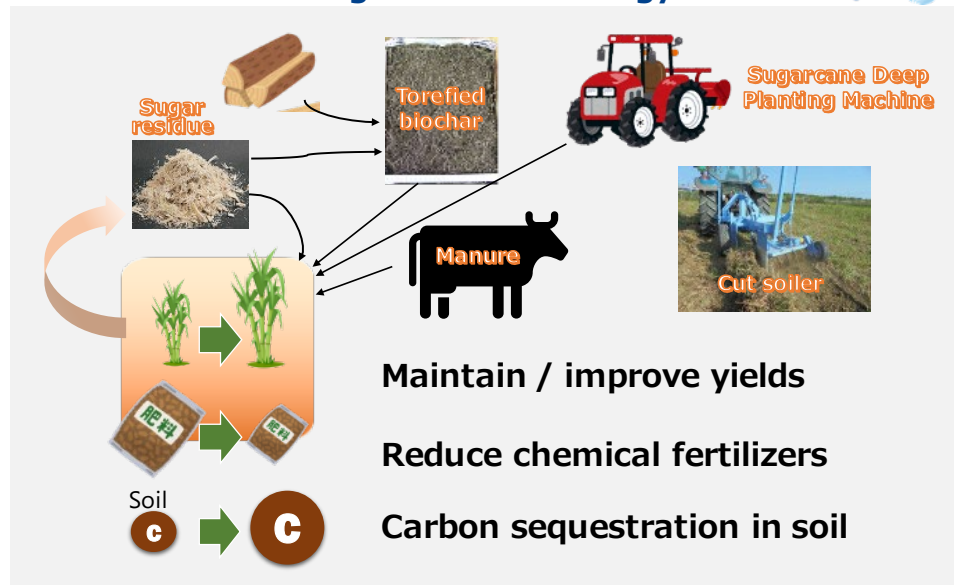
Keynote Speech 1

JIRCAS research activities to contribute to Ishigaki Island and the national strategy “MeaDRI”

Keiichi HAYASHI Program Director, Environment Program, JIRCAS



Reducing Environmental Impact and Improving Productivity through
Resource-recycling Agriculture
+ **New Farm Management Technology**



On Ishigaki Island, average temperatures are rising, and the number of rainless days is increasing. These are said to be due to climate change caused by global warming. It is essential to work on reducing greenhouse gas emissions.

The Sustainable Food Systems Strategy “MeaDRI” developed by the government in 2021 is a policy to achieve productivity improvement and sustainability in the processes from procurement to consumption in agriculture, forestry, and fisheries through innovation.

In this seminar, I will present the issues surrounding the agriculture, forestry, and fisheries industries, the Sustainable Food Systems Strategy MeaDRI, and research and development actions that JIRCAS is engaged in, especially in Ishigaki City.

Keynote Speech 2

Effectiveness and Necessity of Circular Agriculture: Toward Establishment of Sustainable Food Systems

Sadao EGUCHI Senior Principal Scientist, Institute for Agro-Environmental Sciences, National Agriculture and Food Research Organization



Consumption and production are mutually supportive. To realize a circular agriculture and livestock industry locating at the upstream of the food system that sustains our lives and health, it is essential to have the understanding and cooperation of consumers at the downstream of the system.

For NOT Increasing Nr Pool on the Earth...



Significant advantages of reactive nitrogen (Nr)

- Farm soil fertilization → High & stable crop productivity → Food security
- **"New" Nr** supported the population explosion (1.6→6.0 billion) in the 20th century

To build a sustainable food system, how we use Nr while reducing Nr is an issue.

How to reduce **"New" Nr** creation at the most while much more efficiently circulate **"Old" Nr** that already exists in large quantities on the Earth?

We need to shift to an environmentally friendly **circular agriculture** in which organic matter plays a central role.

Soil functions as an essential part!
(In hydroponics, organic Nr cannot be used efficiently)

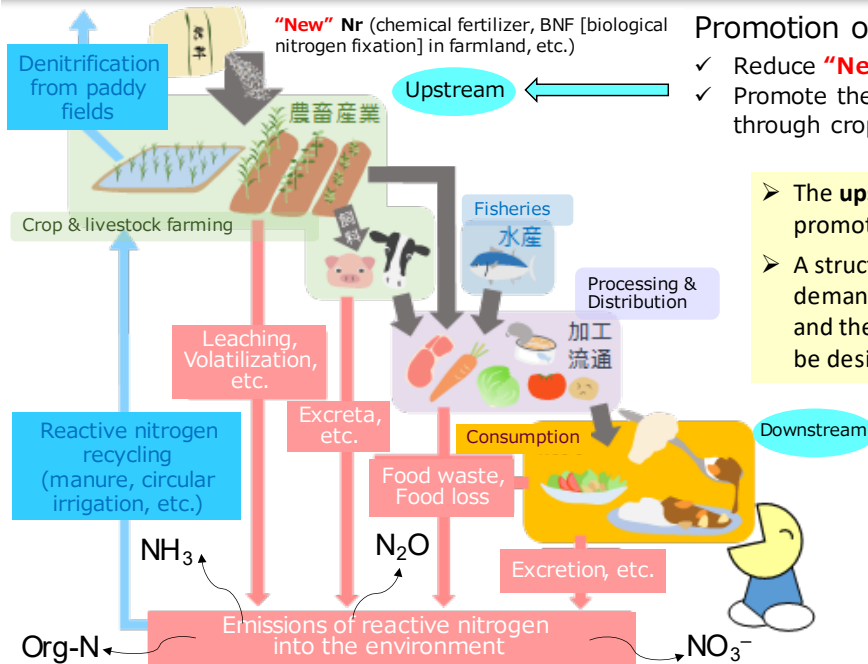


Transforming to circular agriculture that uses organic matter as obvious practice



Nitrogen cascade in food system

(N cascade: staircase-like waterfall with pools and leaks)



Promotion of **Circular Agriculture**

- ✓ Reduce "**New**" Nr (chemical fertilizer)
- ✓ Promote the use of "**Old**" Nr (livestock manure, etc.) through crop-livestock integration, etc.

- The **upstream (food production)** alone cannot fully promote **circular agriculture**.
- A structure that the **downstream (food consumption)** demands **circular agricultural and livestock products** and the upstream responds to the demand needs to be designed.

What is the driving force of Nflow?
→ **Consumer needs (market needs)**

Control over the whole process from consumption to production through the **understanding and cooperation of consumers is required!!**

Partially modified from Eguchi and Hirano (2019)

Conclusion

- **Circular agriculture** must be promoted and realized to build a sustainable food system within the "Planetary boundaries".
- **The effectiveness of circular agriculture** includes increased productivity (yield), improved soil environment (physical and chemical properties), reduced production costs (fertilizer and feed costs), etc.
- **The necessity of circular agriculture** is to reduce environmental load (e.g., nitrogen and phosphorus load) and thereby preserve natural ecosystems (e.g., marine ecosystems along islands' coasts). This will lead to securing tourism resources (social and economic **effectiveness**).
- **Consumption and production** are mutually supportive. To realize **circular agriculture and livestock industry** located at the upstream (**producers**) of the food system that sustains our lives and health, it is essential to have the understanding and cooperation (promotion of **dietary education**, formation of **market needs**, and **public support**) of consumers at the downstream of the system (**consumers**: the main driving force of material flow in the food system).

Keynote Speech 3

Experimental Research in Okinawa Prefecture: Aiming for Sustainable Agriculture in Okinawa

Moritoshi TAMAKI Branch Director, Ishigaki Branch, Okinawa Prefecture Agricultural Research Center



I will present our research on sustainable agriculture, fertilizer reduction, and climate change. It will give you some idea of our work.

To achieve the Sustainable Development Goals, establishing cooperation among Ishigaki City, JIRCAS, Okinawa Pref., and farmers is essential!

The New Basic Plan for the 21st Century Vision of Okinawa

2010: Okinawa 21st Century Vision

A long-term vision for the development of Okinawa by 2030

2012: **Basic Plan for Okinawa 21st Century Vision**

Development of measures to realize the Okinawa 21st Century Vision

2013: **Promotion Plan for Okinawa 21st Century on Agriculture, Forestry, and Fisheries**

In addition to the Basic Plan, it provides a specific direction of progress for agriculture, forestry, and fisheries.

2014: **Okinawa Prefecture Basic Concept for Experimental Research on Agriculture, Forestry, and Fisheries**

Guidelines for the promotion of experimental research

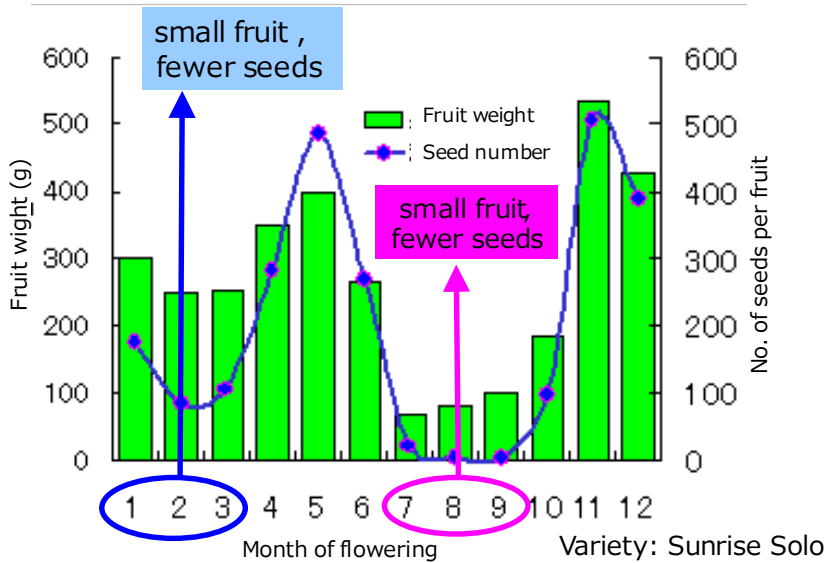
2022: **New Basic Plan for the 21st Century Vision**

Planning for the second half of the period, incorporating the SDGs, on the 50th anniversary of Okinawa's return to Japan

→Promote sustainable agriculture, forestry, and fisheries taking advantage of the subtropical oceanic climate

→Experimental research must also incorporate the SDGs and develop technologies to realize environmentally sustainable agriculture while addressing declining farmers, climate change, and other issues

Papaya pollen preserving method and effects of artificial pollination using preserved pollen 1



Hermaphrodite papaya produces small fruits with fewer seeds in high temperatures in summer and low temperatures in winter because pollen is damaged

Artificial pollination with preserved pollen is effective in avoiding obstacles

Key point: Collect and preserve pollen during high pollen activity and use it during high and low-temperature periods.

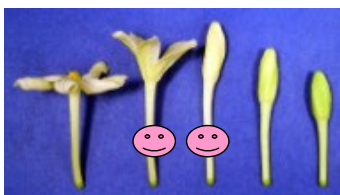
Reference: Tamaki et al. (2011) Seasonal Variations in Pollen Germination Ability, Reproductive Function of Pistils, and Seeds and Fruit Yield in Papaya (*Carica papaya* L.) in Okinawa. J. Japan. Soc. Hort. Sci. 80(2):156-163.

Papaya pollen preserving method and effects of artificial pollination using preserved pollen 2

Pollen Preserving Method

Collect pollen in May-June and October-November. Pollen can be stored for about 240 days at -18°C.

Use of male flowers



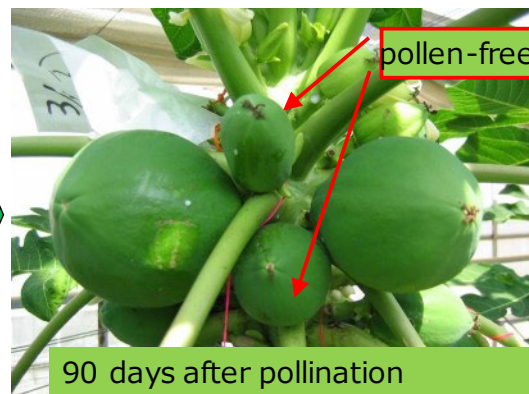
+1 0 -1 young days



preserved pollen



Add 40-80 flowers of preserved pollen per 100cc of tap water. Mix well and spray.



90 days after pollination

Adaptation to climate change at low cost and can be used for other varieties



Panel discussion

Welcomed Mr. Atsushi IRITAKENISH, Deputy General Manager of the Agricultural Affairs Dept. of Ishigaki Island Sugar Co., as a panelist, together with other keynote speakers. Factors preventing the utilization of sugar residue and cattle manure on farmland are presented, followed by a discussion seeking solutions. It was pointed out that an understanding by consumers of resource recycling, and cooperation among the producers, governments, academics, and civil society, are necessary to solve the issue, aside from technological development.



Opinions from the floor

- A seminar on issues faced by farmers or government agencies may help us find a clue for a solution.
- The presentation of research topics is informative, but it cannot be worked on soon. Recommendations that farmers can follow immediately should be included.
- It is good to have public events to approach consumers on the education of diet. Organizing a fair or flea market for agricultural produce would be good.
- New technological research is essential, but the technology must be cheap to use in the field. Combining existing technologies would be an option for it.



What you need to promote resource recycling is

- **Cooperation of producers, governments, academia, and civil society**
- **Understandings by consumers**

Editors Naoko OKA, Koichi TAKENAKA, and Toshihiko ANZAI

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