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## Cross-ministerial **S**trategic **I**nnovation **P**romotion Program(**SIP**)



# “Technologies for Smart Bio- industry and Agriculture”

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Through innovation through the integration of biotechnology and digital technology

# Realize Society5.0

Create / expand Japanese bioeconomy market

( more than 240 billion yen in food / healthcare industry, smart food chain system and innovative biomaterial industry )

# SDGs

Contribute to the achievement of stable food supply in the world, sustainable economy / society, extension of healthy life expectancy ( control of increasing medical expenses )



## Issues to be addressed

Sustainability of resources in the global environment



Become urgent issues in the field of food



「FOOD」 sustainability

Should we imagine to eat forever, not just satisfying to eat now?



### **Global situation**

Uneven distribution of Food ( Total amount of food is sufficient )

Global population growth in future

(9.7 billion in 2050  $\Rightarrow$  Requires 1.7 times more food production of 2010 )

Extraordinary weather

### **Japan situation**

Aging of farmers ( average 67.0 years old in 2019 )

Expansion of fallow ( 423,000m<sup>2</sup> in 2015  $\doteq$  area of Toyama prefecture )

Delayed automation in production of vegetables, fruits, etc.



### Possibility of Japanese Agri-business

It has the potential for development and sustainability due to liberalization and scale expansion in management, so that it can contribute to the world.

On the other hand,

◇ Who should take responsibility?

Issue ⇒ Increase the number of responsible skilled people and organizations, and such human resources development

◇ The limitation of the conventional "food" pipeline type business

( "Make", "Deliver", "Sell", "Eat and use", "Discard" )

High Environmental impact, not friendly to the earth

**Issue ⇒ Mindset of From "discard" to "use", circular economy**



## Sustainability of global environment and resources

### "Food" sustainability

#### Sustainability of Agriculture

Small Labor operation

Low Environmental Impact

Increase of New farmer

#### Sustainability of Food/Ingredient

Stabilization of supply and demand balance

Reduction of loss at the distribution and storage stage globally

Addition of value to foods that meet market needs

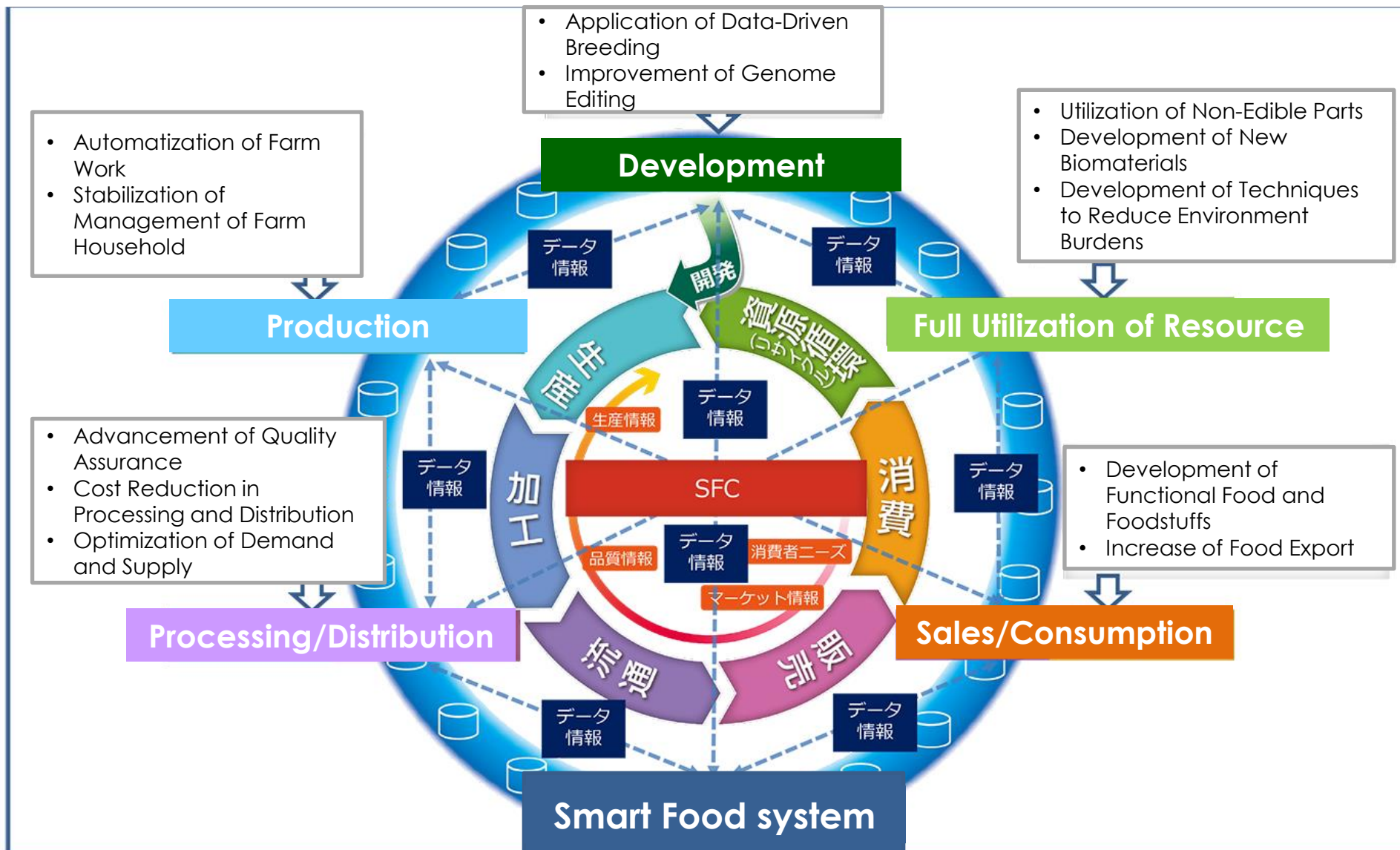
#### Sustainability of "Food" related resources / environment

Utilization and materialization of non-edible portion/food residues

High functional and high value added food-based biomaterials

Reducing the environmental impact of bio-related industries

- As main frame, we will develop **the circular economic model (smart food system) in "food"**, we will establish **"data / information utilization infrastructure"** and achieve **"individual target development" as essential parts** for **realizing the sustainability of "food"**.
- Contribute to
  - revitalize the **utilization of bio-related data**
  - promote **entry into food-related businesses** in different fields and venture companies
  - make **agriculture high growth industry** with Japanese agricultural products and processed foods, including overseas exports.





Stage	Research Subject
<div style="background-color: red; color: white; padding: 5px; text-align: center;">Utilization of Information</div> <div style="background-color: purple; color: white; padding: 5px; text-align: center;">Processing / Distribution</div> <div style="background-color: blue; color: white; padding: 5px; text-align: center;">Value Chain Data Infrastructure</div>	<ul style="list-style-type: none"> <li>◎ <b>Smart Food Chain</b> <ul style="list-style-type: none"> <li>• Development of fundamental technologies and applications to establish agricultural data collaboration platform, which enables the linkage among production, processing, distribution, sales and consumption</li> <li>• Reduction of food loss through precision prediction of shipment time, High value addition through retention of quality and freshness, Establishment of data collaboration platform intended to promote the efficient cooperative distribution by data linkage within food chain</li> </ul> </li> <li>◎ <b>Establishment of Value Chain Data Infrastructure</b> <ul style="list-style-type: none"> <li>• Development of the system which enables the linkage and the comprehensive utilization of bio-database, Promotion of industrial utilization of bio-data by developing open and closed system</li> </ul> </li> </ul>

Stage	Research Subject
<div style="background-color: teal; color: white; padding: 5px; text-align: center;">Development</div>	<ul style="list-style-type: none"> <li>◎ <b>Data-driven Breeding</b> <ul style="list-style-type: none"> <li>• Establishment of data-driven breeding and breeding new-value added cultivars</li> </ul> </li> <li>◎ <b>Genome Editing</b> <ul style="list-style-type: none"> <li>• Development of precise genome editing and related technologies which contribute to the promotion of breeding efficiency based on genomic information</li> </ul> </li> </ul>
<div style="background-color: blue; color: white; padding: 5px; text-align: center;">Production</div>	<ul style="list-style-type: none"> <li>◎ <b>Smart Production System</b> <ul style="list-style-type: none"> <li>• Labor-saving by developing the robot farming machines which can move between fields automatically under remote monitoring</li> <li>• Efficient data-driven production of vegetables and crop</li> </ul> </li> </ul>
<div style="background-color: orange; color: white; padding: 5px; text-align: center;">Sales / Consumption</div>	<ul style="list-style-type: none"> <li>◎ <b>Establishment of the “Food” System Contributing to Extension of Healthy Life Expectancy</b> <ul style="list-style-type: none"> <li>• Development of health condition indicators and evaluation system for minor physical and psychological complains</li> <li>• Collection of scientific evidence on functional food and agricultural commodities</li> <li>• Accumulation of intestinal microbiome data, Verification of functional foods with prototypes</li> </ul> </li> </ul>
<div style="background-color: lightgreen; color: white; padding: 5px; text-align: center;">Full Utilization of Resource</div>	<ul style="list-style-type: none"> <li>◎ <b>Agro-Biological and Chemical System</b> <ul style="list-style-type: none"> <li>• Development of technologies to utilize unused agricultural resources, being critical for next-generation chemical industry</li> </ul> </li> </ul>





## Data/Information Utilization Infrastructure

Utilization of Information

Value Chain Data Infrastructure

## Individual Target Development

Development

Production

Processing / Distribution

Sales / Consumption

Full Utilization of Resource

## Social Impact

Information utilization improves productivity and reduces need for skilled techniques in agriculture. It leads to improve income and management of farm household. Consequently Increase of new farmer and stabilization of food supply are achieved.

Data utilization stabilizes food supply demand balance and realizes quality assurance through food storage and distribution. Consequently food loss and waste are reduced.

Expansion of food export encourages food and food-related industry in Japan.

Increase of functional food and foodstuffs which are shown to have positive effect on health scientifically, most of them are ingredients in Japanese cooking, activates healthcare market in Japan.

Production of biomaterials with high global competitiveness from food waste or non-edible parts is realized in manner of environment-friendly way. It leads to improve functions and values of products and expands Japanese bioeconomy.