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## Developing Technology for the Mass Production of Plant-made Proteins Establishing a Plant Bio-foundry as a Bio-manufacturing Demonstration Platform

Chiyoda Corporation (Chiyoda) is constructing a demonstration facility (Figure 1) for new technology to produce useful proteins from plants, under a NEDO\*<sup>1</sup> initiative, 'Development of Bio-derived Product Production Technology to Accelerate Realization of Carbon Recycling'.<sup>2</sup> The new technology reduces CO<sub>2</sub> emissions and uses plants that enable inexpensive and animal-free\*<sup>3</sup> production of a wide range of products, including vaccines and other pharmaceuticals, regenerative medicine products, cosmetics and functional foods. The demonstration facility is the first 'Plant Bio-foundry' in Japan, enabling companies to develop practical applications for plant bio-manufacturing.

This topic will be displayed in NEDO and Chiyoda booths in 'Bio Japan 2024' at PACIFICO YOKOHAMA from October 9 to 11, 2024.



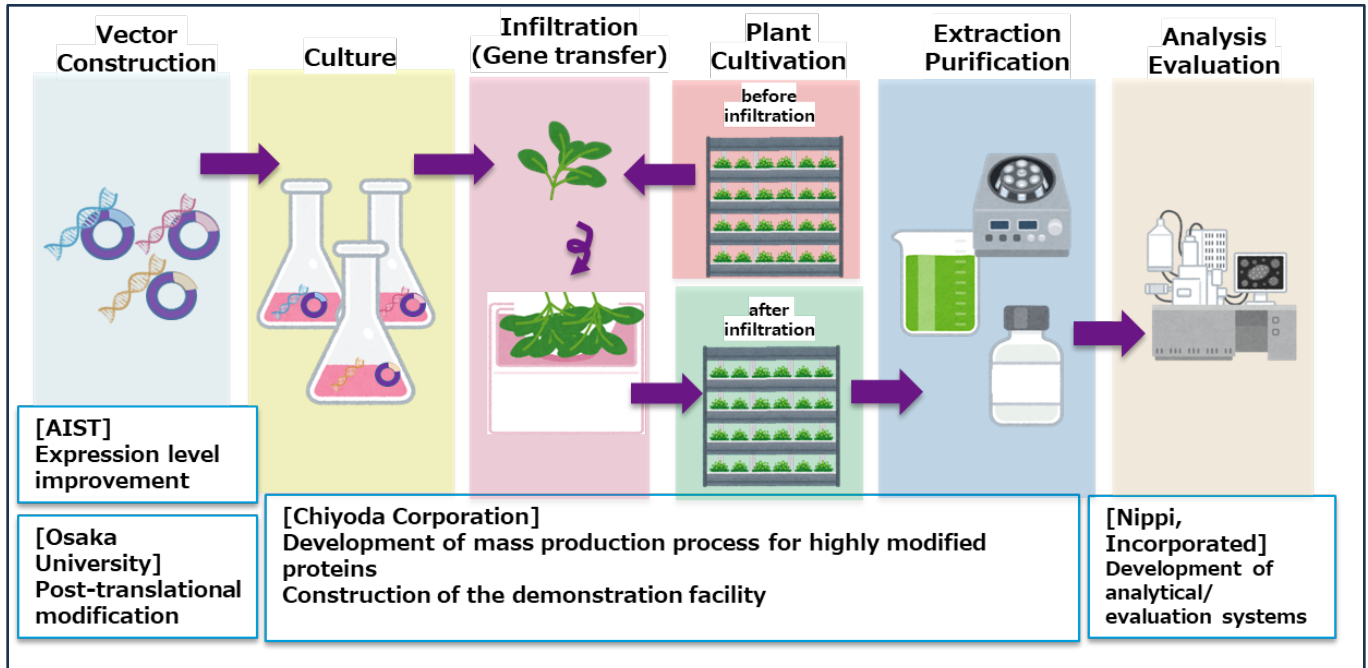
**Figure 1: Demonstration Facility Model**

### 1. Background

Bio-manufacturing, using organisms such as plants and microorganisms, is more energy-saving than conventional chemical processes used to produce substances and does not rely on fossil resources for raw materials. It is expected to transform manufacturing systems, leading to the realization of a carbon-recycling society and sustainable economic growth.

NEDO commenced its bio-manufacturing initiative in 2020, to resolve challenges such as low

production efficiency and inferior physical properties of bio-based products compared to petroleum-based products. In collaboration with Nippi Inc., AIST\*4, and the International Center for Biotechnology (Osaka University), Chiyoda commenced working on the ‘Development of mass production technology for highly modified proteins using plants’ in 2022, aiming to inexpensively and stably produce complex proteins using plants, eg: tobacco leaves (Figure 2).



**Figure 2: Mass Production Technology for Highly Modified Proteins using Plants**

## 2. Results

The demonstration facility is scheduled to commence operation in the spring of 2025 and is capable of bench-scale to pilot-scale production. As the future first ‘Plant Bio-foundry’ in Japan, process development and sample manufacturing will be conducted for useful substance products, developed by companies to support practical application.

### Plant Biofoundry

- Construction Site: Chiyoda Corporation Koyasu Research Park (Figure 3)
- Facility Scale: Total floor space: Approx. 490m<sup>2</sup> (including production and development areas)
- Completion date: End of January 2025
- Expected Functions:
  - Support research and development of plant bio-manufacturing by companies and contribute to the implementation of social services
  - Process development and commission testing of material production using plants
  - Scale-up studies from laboratory to bench/pilot to commercial scale
  - Feasibility studies



**Figure 3: Demonstration Facility Construction**

### **3. Future Plans**

Following completion of the main theme of verification experiments on the large-scale production of useful proteins using plants, the facility will enable Chiyoda to enhance its services through the development of practical applications for plant bio-manufacturing, thereby contributing to the development of the bio-manufacturing industry.

Increasing the number of industrial material production system demonstrations will enable NEDO to accelerate the social implementation of bio-derived products, and create new products and services to support the revitalization of the Japanese bio-economy, facilitating carbon neutrality by 2050 and reducing greenhouse gas emissions in the bio-manufacturing field.

As a comprehensive engineering company, Chiyoda is engaged in a multitude of businesses to realize a decarbonized society and social implementation in the bio-manufacturing field. The construction of the 'Plant Bio-foundry' as the foundation for the future commercialization of plant-based material production technology, supports Chiyoda's purpose of 'Enriching Society through Engineering Value' as it continues contributing to the development of a sustainable society.

[Notes]

- \*1 New Energy and Industrial Technology Development Organization
- \*2 FY2020 to FY2026 (planned)  
Overview: [Development of Production Technology for Bio-derived Products to Accelerate Realization of Carbon Recycling](#)
- \*3 Animal-free: Products that do not use animal materials
- \*4 National Institute of Advanced Industrial Science and Technology

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