Advanced Agricultural Energy Science and Technology Research Division

<Term>
April 1, 2016 – March 31, 2021>

<Menbers>
■Tokyo University of Science
・ Professor Kazuyuki Kuchitsu (plant physiology)
・ Professor Tatsuya Tomo (photosynthesis)
・ Associate professor Mutsumi Sugiyama (transparent solar cells, agricultural sensors)
■Tokyo University of Science, Suwa
・Associate professor Yasuyuki Watanabe (agricultural solar cells, photosynthesis measurement)
・Dr. Noboru Ohashi (organic photovoltaic solar cells, plant cultivation)
・Professor Hideaki Matsuse (communication and network engineering, agricultural IoT)
・Assistant professor Kazuhiro Yamaguchi (image and signal processing)
・Professor Matsuoka Takashi (quantum information theory)
■Yatsugatake Central Agricultural Institute
・Visiting researcher Hisashi Oku (practical agriculture)
■Kyushu University, Chihaya Adachi Laboratory
・Assistant professor Hajime Nakanotani (agricultural organic LED)
■ **ideal star** inc.
・Visiting professor Kenji Omote (Organic phovoltaic solar cell)
■ Japan Advanced Institute of Science and Technology
・ Visiting professor Tatsuya Shimoda (Printed Electronics)

---

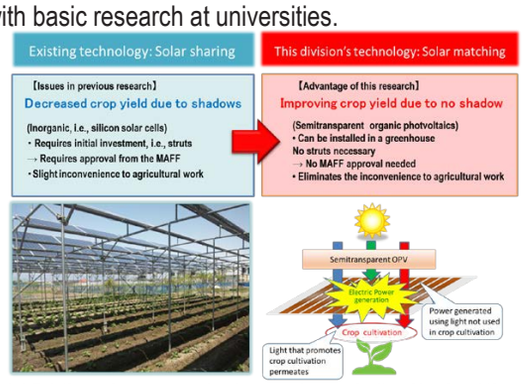
1. The idea behind the establishment of this division

The world population is expected to surpass 10 billion people by 2100. To solve global energy, environmental and food problems, changes to agricultural markets and industry structures will need to be predicted, and a forum to provide new value throughout the world will need to be built by leading the way with basic research at universities.

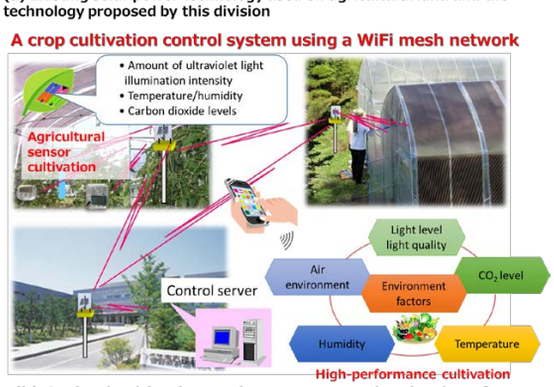
2. Innovative agricultural engineering based on solar matching

"Solar sharing," in which solar panels are installed in gaps on agricultural land, is gathering interest; however, as shown in Figure 1, the effect of shadows cast by the panels on crops and the high installation costs are a few of the issues. To address these issues, we proposed "solar matching (agricultural OPV)," which allows the light necessary for crop cultivation to permeate, and which stores the remaining light in organic photovoltaic cells capable of generating power, and we demonstrated that this technology allows both crop cultivation and solar power generation. We plan to scientifically verify if this approach can be used to develop further technologies to improve crop yield in horticulture, such as in agricultural fields and in sunlight-using plant factories.

This research division aims to combine the science, engineering and pharmacology technologies of Tokyo University of Science with the agriculture-related engineering technologies of Tokyo University of Science, Suwa, to achieve both agriculture and power generation through "solar matching," to improve agricultural productivity through the use of the Internet of Things (IoT), to provide society with "innovative agricultural engineering" such as labor-saving solutions, and to promote the development of Japanese agriculture and industry.



(a) Existing solar power technology used on agricultural land and the technology proposed by this division



(b) Optimal cultivation environment control technology for crops that makes use of agricultural IoT

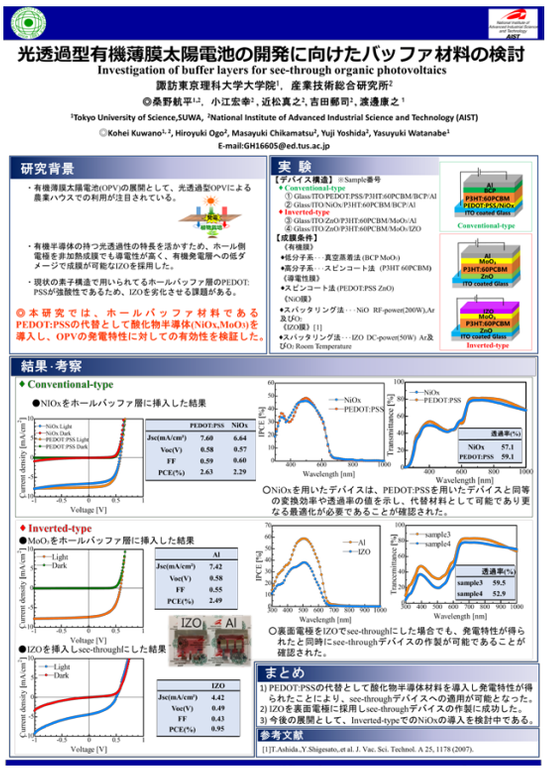
Research Highlight 1

Investigation of buffer layers for see-through organic photovoltaics

2017 Autumn JSAP

The 78th JSAP Autumn Meeting, 2017

Schedule: Sep 5, 2017 - Sep 8, 2017
Venue: Fukuoka Convention Center



Research Highlight 2

Possibility of cultivating plants using see-through organic photovoltaics for photosynthesis

JAPAN SOLAR ENERGY SOCIETY
Student Award

Output and Transmitted Radiation Evaluation of OPV with combined function

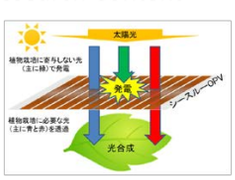
Tokyo University of Science, SUWA
Taichi IINO, Tatsuya NUMATSU, Keigo MATSUOKA,
Youichi HIRATA, Noboru OHASHI, Yasuyuki WATANABE

JAPAN SOLAR ENERGY SOCIETY
November 24, 2016-November 25, 2016
Matsuyama City General Community Centerin Matsuyama, Ehime

Professor Youichi Hirata
and Taichi Iino

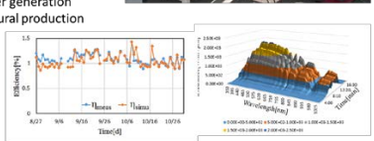
Award ceremony
（May 29, 2017@Morito memorial hall）

Research Content



Principle of solar power generation
compatible with agricultural production

(a) Measurement setup of incident light and transmitted light spectrum



(b) Experimental values and simulation values of daily cumulative conversion efficiency

(c) Change of incident light and transmitted light spectrum of OPV

Experimental results of see-through OPV