SATREPS and Beyond

Japan Science and Technology Agency (JST)
Partnerships for Enhanced Engagement in Research (PEER)
Science Participants’ Conference 2013,
4 October, 2013
Bangkok, Thailand
78 projects in 39 countries since 2008
41 projects in 13 Asian Countries
Four Birds with One Stone: Energy Production System Resolves All Problems at Once

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Multi-beneficial Measure for Mitigation of Climate Change in Vietnam and Indochina Countries by Development of Biomass Energy</th>
<th>Research Period</th>
<th>5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Investigator</td>
<td>Research Prof. MAEDA Yasuaki / Research Organization for University-Community Collaborations, Osaka Prefecture University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborators</td>
<td>Ehime University, Osaka City University, Japan International Research Center for Agricultural Sciences (JIRCAS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ODA Recipient Country</td>
<td>Socialist Republic of Vietnam</td>
<td>Counterpart Research Institutions</td>
<td>Vietnam National University, Hanoi (VNU-Hanoi), etc</td>
</tr>
</tbody>
</table>

General Description of the Research Project

Vietnam faces serious problems: the 9 million ha of land contaminated with defoliants or devastated by activities such as slash-and-burn agriculture, the atmospheric pollution in urban areas resulting from rapid economic development, and the poverty in mountainous regions. The goal of this project is to plant trees in the devastated land and use them to produce oil as a feedstock for fossil-fuel alternatives, manufacturing clean fuels that can be used in urban areas. Not only would this resolve three issues at once — revitalize devastated land, prevent atmospheric pollution and create local jobs — it would also create a biomass energy production and utilization system that would be an effective means of mitigating climate change.
Storage Tank for agent orange at DaNang Air port
Cat Fish (6 months)
Cat Fish Fillet Production in An Giang (200,000t)
BDF made of Cat Fish fat

Cat Fish Fat Oil

BDF processed by Co-solvent Method
Boat for garbage Collection
[Co-solvent method]

**<before reaction>**

Conventional Method
⇒ heterogeneous

**Co-solvent method**

⇒ homogeneous

Add 10% Acetone

**<After reaction>**

Conventional
⇒ Excess amounts of MeOH

Co-solvent

Production of soap
⇒ Waste

No soap
Is it possible to use B100 BDF produced by Co-solvent method

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>inedible</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jatropha (%)</td>
<td>Tabaco (%)</td>
</tr>
<tr>
<td>Saturated Fatty Acid</td>
<td>17.3 FFA(13%) Two step</td>
<td>9.4 FFA(49%)</td>
</tr>
<tr>
<td>BDFPurity (%)</td>
<td>99.1</td>
<td>98.8</td>
</tr>
<tr>
<td>Yield (%)</td>
<td>96.2</td>
<td>96.6</td>
</tr>
<tr>
<td>Co-solvent</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>BDF Raw Material</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Project Title</td>
<td>Project on Promotion of Green Economy with Palm Oil Industry for Biodiversity Conservation</td>
<td>Research Period</td>
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<tr>
<td>Principal Investigator</td>
<td>Prof. ASAMI Kenji / Faculty of Environmental Engineering, The University of Kitakyushu</td>
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<td>Collaborators</td>
<td>Kitakyushu Foundation for the Advancement of Industry Science and Technology , Kitakyushu International Techno-Cooperative Association</td>
<td></td>
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<tr>
<td>ODA Recipient Country</td>
<td>Malaysia</td>
<td>Counterpart Research Institutions</td>
</tr>
<tr>
<td>General Description of the Research Project</td>
<td>The current palm oil industry is inefficient in utilization of resources in creation process, and discharge energy and biomass to the environment wastefully. Therefore, the Project aims to improve the situation by utilization of excess energy and biomass more efficiently with technology developed under the Project, resulting in improvement of environmental quality and conservation of biodiversity, and establishment of win-win situation between development and environment. “Zero-discharge” in the Project means that all by-products from mills will be transformed into useful biomass , energy and recycled water which are valuable or tradable as a result of improved energy efficiency and resource utilization in the process of palm oil production. The level of gasses (Sox and NOx) and particle matter discharged will be controlled under the regulatory standard, and methane from the biomass waste will be collected.</td>
<td></td>
</tr>
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</table>
JICA Bornean Biodiversity Ecosystems Conservation Program Phase II (BBEC II)

Purposes: Biodiversity conservation around the Kinabatangan, Sabah and creation of new green innovative industries. Ramsar Wetland as litmus paper!

- Sabah State
- Nature Eco-tourism
- Promising Income
- Palm Oil Greatest Income

Palm Oil mil ⇒ POME
⇒ Anaerobic Pond
⇒ Treated Water
COD >1000ppm
BOD<100ppm

Pollution STOP!

Zero Discharge

Bio-diversity

Brand & Green Industry
Great Return to Green City

From Death Sea to Environmental Leadership Awarded by UN (1992)
The Environmental Future City (2011)
The OECD Green Growth City (2011)

Not only the environment but also industries greatly progressed!
New Nippon Steel Co. Mitsubishi Chemicals Co. TOTO etc.!!
Production of Powdery Fibers by Superheated Steam

- **Bamboo**
- **Mesocarp Fiber**

**Superheated Steam**

- $H_2O$
- $H_2O$
- $H_2O$

200～250℃

**Powdery Fibers**

**Less Water Adsorption**

**Odd smell Volatilize!**

**Use of Excess Steam In Palm Oil Industry**

**Break and Crash** Biomass fillers with higher aspect ratios!

**Quickly Dry!**

**Higher Quality Biomass Composite!**
Cost for Biomass Composite in Japan

**Bamboo**

- **Cost for 1kg powder**
  - 490JY/kg (18RM/kg)
- **By superheated steam treatment**
- **Result in 2009**

**Pellet**

- **Resin** 7RM/kg (pellet)
- **Resin** 3.5RM
- **Bamboo Powder** 0.95RM
- **Blend and Pelletize 1 RN**

**Cost for 1kg powder**

- **Estimated cost**
  - 50JY/kg (1.9RM/kg)
- **5.45RM/kg (pellet)**

**Higher Quality**: More Elasticity, Size Stability

- **Plastics**
- More stable and larger amount of biomass (MF) from Palm Oil Industry

**Cost down**

- **High aspect ratio bamboo powder**

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Development of New Biodiesel Synthesis in Thailand</th>
<th>Research Period</th>
<th>4 Years</th>
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<td>Principal Investigator</td>
<td>Prof. ASAMI Kenji / Faculty of Environmental Engineering, The University of Kitakyushu</td>
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<td>Kingdom of Thailand</td>
<td>Counterpart Research Institutions</td>
<td>Chulalongkorn University</td>
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General Description of the Research Project

New technological and social development for the utilization of bio-based fuels is strongly required to harmonize both economic growth and improved living standards with environmental problems in South-East Asian countries like Thailand. This project aims at developing a new technology by which high quality diesel fuel can be produced at high energy efficiency with a simple process. Specifically, a low-cost and environmentally-friendly processing method will be developed for making aliphatic hydrocarbons for diesel fuel through the decarboxy-craking of triglyceride over solid catalyst. The method will be disseminated as a novel bio- fuel production which is different from Fatty Acid Methyl Ester (FAME) or Hydrocracking process.
# Reducing CO2 Emissions with Vehicle Biofuel Made from Non-edible Vegetable Oil

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Innovation on Production and Automotive Utilization of Biofuels from Non-food Biomass</th>
<th>Research Period</th>
<th>5 Years</th>
</tr>
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<tbody>
<tr>
<td>Principal Investigator (Affiliation)</td>
<td>Dr. YOSHIMURA Yuji / Research Center for New Fuels and Vehicle Technology-AIST</td>
<td></td>
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</tr>
<tr>
<td>Collaborators</td>
<td>Waseda University</td>
<td></td>
<td></td>
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<tr>
<td>ODA Recipient Country</td>
<td>Kingdom of Thailand</td>
<td>Counterpart Research Institute</td>
<td>NSTDA,TISTA,KU,KMUTNB,etc</td>
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## General Description of the Research Project

Using Jatropha as a biofuel feedstock that does not compete with food crops

The utilization of biofuels in the transportation sector could help to mitigate global warming, but because of the risk that production of biofuels derived from grains or vegetable oil will compete with food crops, there is a demand for manufacturing technologies that exploit nonfood sources of biofuel. For this project we are cooperating with Thailand, which is the Asian automotive production hub, to develop the production technologies of fuels from Jatropha, an inedible plant. We are also conducting engine tests and developing the automotive utilization technologies, as well as estimating CO2 emission reduction benefits through life cycle assessments.
3-6. High-Quality BDF Production PP (1.0 ton/day) @TISTR

BDF Production Unit (1.0 ton-BDF/day)

- Jatropha oil
- Acid-Methanol
- Transesterification Reaction
- Distillation
- Recycled MeOH
- Dehydration of JO
- Esterification Reaction
- Alkali-Methanol
- Water
- Washing
- Dehydration of BDF
- BDF
- Partial Hydrogenation
- High-quality BDF
- H2
- 1st generation BDF
- 1.5th generation BDF

BDF Upgrading Unit (partial hydrogenation of polyunsaturated FAME)

High-quality BDF
### Integrating Agriculture with Locally Self-sufficient Bio-energy Generation in Asia

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Sustainable Integrations of Local Agriculture and Biomass Industries</th>
<th>Research Period</th>
<th>5 Years</th>
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<tbody>
<tr>
<td>Principal Investigator (Affiliation)</td>
<td>Prof. SAKODA Akiyoshi / Institute of Industrial Science, The University of Tokyo</td>
<td></td>
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<tr>
<td>Collaborators</td>
<td>National Agriculture and Food Research Organization</td>
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<td>Socialist Republic of Viet Nam</td>
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<td>Hochiminh City University of Technology</td>
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**General Description of the Research Project**

Population growth in Vietnam has led to a number of serious problems including food and energy shortages, environmental degradation, and poverty. We are seeking to address these problems by designing systems and developing relevant technologies for integrating locally self-sufficient, sustainable agriculture with sustainable energy in the form of biomass. We are focusing in particular on the construction of a plant that puts these ideas to the test by manufacturing bio-ethanol from rice straw and biogas from domestic animal manure.

**From experimentation to verification: operating a biomass plant with sights on practical implementation**

We installed an experimental bio-ethanol plant on the grounds of Ho Chi Minh City University of Technology and are conducting pilot operations while providing local personnel with on-site technical training.
Objectives:
A model of "Sustainable Integration of Local Agriculture and Biomass Industries" is developed and demonstrated in an area of Southern Vietnam, focusing on biomass conversions for the production of biofuels, such as bioethanol and biogas, and bio-based materials.

Outputs:
(1) A methodology for designing "Sustainable Integration of Local Agriculture and Biomass Industries" is developed.
(2) Small-scale regional biorefinery processes based on the concept of local production of biofuels and bio-based materials for local consumption are developed and demonstrated.
(3) Key technologies for biorefinery processes, including production technologies of biofuels and bio-based materials, are studied and developed. “Sustainable Integration of Local Agriculture and Biomass Industries”
An Example of Sustainable Biomass Towns in Asia

**Regional Material Cycles**
- Livestock breeding
  - Excrement
- Rice cultivation
  - Organic fertilizers ↔ residues
  - Inorganic fertilizers ↔ ash
- Straw
  - Husk
  - Rice grain
- Local Bioenergy Utilization
  - Household fuels
    - Cooking
    - Heat
  - Vehicle fuels
    - Truck
    - Motorcycle

**Local Biomass Resources**
- Local biofuels for local uses
- Bioethanol production
  - Bioethanol
- Biogas production
  - Biogas
- Biomass combustion
- Organic fertilizers ↔ residues
- Inorganic fertilizers ↔ ash
- Animal feed ↔ residues

**Biomass Utilization Process Complex**

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Creating Drugs Effective against the Dengue Virus from Human Beings

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Research and Development of Therapeutic Products against Infectious Diseases, especially Dengue Virus Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Period</td>
<td>4 Years</td>
</tr>
<tr>
<td>Principal Investigator</td>
<td>Prof. IKUTA Kazuyoshi / Research Institute for Microbial Diseases, Osaka University</td>
</tr>
<tr>
<td>Collaborators</td>
<td>None</td>
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<tr>
<td>ODA Recipient Country</td>
<td>Kingdom of Thailand</td>
</tr>
<tr>
<td>Counterpart Research Institutions</td>
<td>Department of Medical Sciences (DMSCs) Ministry of Public Health</td>
</tr>
</tbody>
</table>

General Description of the Research Project

Dengue fever is a viral disease spread by mosquitoes that infects 50 million people living in the topics every year, with 250,000 suffering seriously as a result, but no effective therapies have yet been discovered. They are studying patients and microorganisms from Thailand to contribute to the development of drugs effective against dengue fever. Since the human body creates proteins (antibodies) to combat the dengue virus, they are investigating these proteins to find any that appear particularly effective against the virus. They discovered target antibodies and now are testing one of them on Marmosets in Japan. They are now applying to PCT (WO2013035345)
A project for earthquake and tsunami mitigation

Video clips of projects at youtube site
SATREPS is not just a joint research program!

Science
Joint
Research

New Technologies
Building Research Center
Education
Guideline Policy Making
Benefit to local communities

Socio-economic Application

HR Development

Capacity Building
Knowledge Sharing
Brain Circulation
Tech Transfer

New Scientific Achievement

Building Education
Thank you!

Masahito@jstsg.org
# Funding for Science and Technology R & D in Japan

## Japanese governmental Science and Technology System

### Ministries
- **MEXT**: Min. of Education, Culture, Sports, Science & Technology
- **METI**: Min. of Economy Trade & Industry

### Funding Bodies
- **JSPS**: Japan Society for the Promotion of Science
- **JST**: Japan Science and Technology Agency
- **NEDO**: New Energy & Industrial Technology Developing Organization
- **AIST**: Advanced Industrial Science and Technology

### R&D Performance
- **Universities etc**: 758 schools (National+Public+Private)
- **RIKEN, NIMS, JAXA, JAEA, NEDO, etc**

## Japanese Innovation Scheme

### Innovation Phase
- **Human Resource Developing**
- **Academic Research (Bottom Up)**
- **Basic Research (Top Down)**
- **Technology Transfer (Phase 1)**
- **Technology Transfer (Phase 2)**
- **Commercialize**

### Budget Scale (Image) / Year
- **JPY 1 B**: Large budget for selected Researchers
  - about 400 projects per year
- **SGD 10 M**: Small budget for many Researchers
  - more than 20,000 Scientists per year

### JST, JSPS, NEDO...
- **JST**: Competitive Program
- **JSPS**: International Academic Exchange, Grants-in-Aid for Scientific Research for Young Scientists, etc
- **NEDO**: Center for IP Strategies, J-STORE (Data base), New Technology Presentation Meetings, Center for R&D Presentation Meetings, Miraikan (National Science Museum), etc

### R&D Performance
- **Researchers**: 839,000
- **Universities**: RIKEN etc
- **AIST**: Business enterprise Sectors

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Please visit [http://www.jst.go.jp/](http://www.jst.go.jp/)