

8 October, 2016  
SPREAD Co., Ltd.

## **Joint Research of Cultivation Technology for Plant Factories with Glutathione**

SPREAD Co., Ltd.(HQ: Kyoto, Japan; CEO: Shinji Inada; hereinafter, "SPREAD"), JX Nippon Oil & Energy Corporation (HQ: Tokyo, Japan; CEO: Tsutomu Sugimori; hereinafter, "JX Nippon Oil & Energy") and Okayama Prefectural Technology Center for Agriculture, Forestry, and Fisheries, Research Institute for Biological Sciences (Lab: Okayama, Japan; Director: Tomonori Shiraishi; hereinafter, "RIBS Okayama") have made an agreement for the joint research of cultivation technology for plant factories using artificial lighting (hereinafter, "plant factory" or "plant factories") with Glutathione.

Glutathione is a tripeptide, and is known for its function to promote the production of crops through the activation of photosynthesis. However, the effects vary by duration and quantity of administration of Glutathione. The effective use of Glutathione resulted in a successful 40% increase in productivity for the harvest of potatoes in research by RIBS Okayama.

Joint research will be conducted to verify the optimized administration and profitability by experiments shown below. It is expected that vegetable cultivation at plant factories will play a major role as a measure against the risk of a destabilized food supply due to the frequency of extreme weather conditions, such as torrential rain and intense heat waves, which have occurred in recent years and soil contamination and adverse effects on people from excessive usage of pesticides.

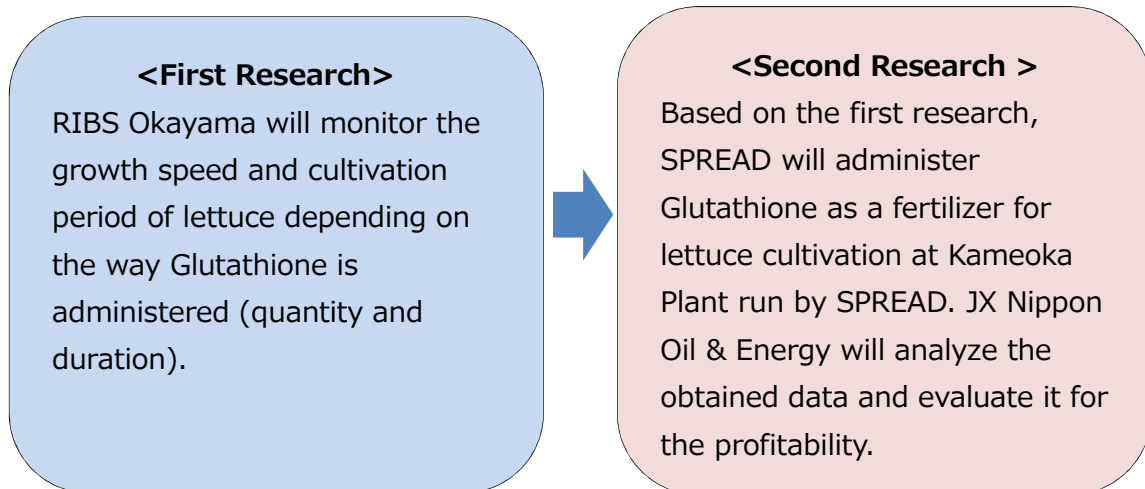
SPREAD and JX Nippon Oil & Energy will continue to put efforts towards overcoming the world's agricultural and food problems by creating innovations for sustainable vegetable production which enables stable food production in the world without influence of climate change.

## News Release

### < Description of joint research >

1. Duration : 1 year from September 2016 (Planned)
2. Role of each company
 

RIBS Okayama	Considers the way of administration of Glutathione (quantity and duration)
SPREAD	Generates the obtained data for the administration of Glutathione at the plant factory
JX Nippon Oil & Energy	Analyzes the obtained data, evaluates the profitability and provides the know-how



### < Company description >

SPREAD Co., Ltd.

- |                     |   |
|---------------------|---|
| Establish           | : 5 January, 2006   |
| Address             | : Kyoto Research Park #8, 90 Chudojiawata-cho,<br>Shimogyo-ku, Kyoto  |
| Capital             | : 87.4million yen   |
| Business activities | : Plant factory operation and vegetable production                    |
| URL                 | : <a href="http://www.spread.co.jp/en">http://www.spread.co.jp/en</a> |

SPREAD has managed a plant factory as the leading company to pursue sustainable farming and overcome global agricultural issues and food problems. SPREAD currently manages the Kameoka Plant (Kyoto, Japan) which is the largest single lettuce factory in the country for vegetable cultivation that produces 21,000 heads of lettuce every day, and sells products under the “Vegetus” brand at 2,100 outlets across Japan.

## News Release

### JX Nippon Oil & Energy Corporation

Establish : 10 May, 1888  
Address : 1-2 Otemachi 1-chome, Chiyoda-ku, Tokyo  
Capital : 139.4 billion yen (100% investment of JX Holdings, Inc.)  
Business activities : Refining and marketing of petroleum and petrochemical products  
Importing and selling of gas and coal  
Supply of electricity  
Developing, manufacturing and marketing of fuel cell,  
solar power generation and storage batteries  
URL : <http://www.noe.jx-group.co.jp/english>

JX Nippon Oil & Energy has sold Astaxanthin as the natural pigment for color improvement for salmon in Europe and the USA, and is aiming to expand its health and nutrition related businesses with its know-how of the bio-business.

### <Reference>

Okayama Prefectural Technology Center for Agriculture, Forestry, and Fisheries,  
Research Institute for Biological Sciences (Okayama Prefecture)

Establish : 1996  
Address : 7549-1 Yoshikawa, Kibichuo-cho, Kaga-gun, Okayama  
Research activities : Mass-producing, quality improvement and branding of  
bio-materials and food resources  
Development of plant preserving technologies  
in the eco-friendly way  
Nurturing new cultivar  
Research and Development of functional materials  
generated by microbial enzymes  
URL : <http://www.pref.okayama.jp/soshiki/203>

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