

# Science and Technology Cooperation on Global Issues

## International Cooperation Jointly Creating “Knowledge”

Global-scale problems including global warming, food issue, natural disaster and infectious disease have been increasingly complex. In particular, the influence on developing countries with vulnerable socioeconomic infrastructures is critical. The international community is now required to work together to approach such problems, since it is hard for only individual countries or regions to tackle them. In addition to traditional cooperation systems, innovation by science and technology is also expected to play an important role in providing solutions for responding to complex and growing issues.

Under this circumstance, and in accordance with the Japanese government’s policy to promote science and technology diplomacy as set forth in the Council for Science Technology Policy, JICA initiated the cooperation<sup>1</sup> focusing on the utilization of science and technology for developing countries in 2008. Based on Japan’s science and technology, JICA aims at creating newer “knowledge” by international joint research between Japan and developing countries, as well as solving global-scale issues by giving research outcomes back to the real world.

### ● Science and Technology Research Partnership for Sustainable Development (SATREPS)

#### 1. Overview

This program is designed to promote international joint research in which both Japanese research institutions and those of developing countries work together based upon the social needs in developing countries under the framework of JICA Technical Cooperation Project. Its aims are to acquire new knowledge and to utilize research outcomes to the benefit of the society with a view to resolving global issues such as the environment and energy, biological resources, disaster prevention, and infectious diseases.

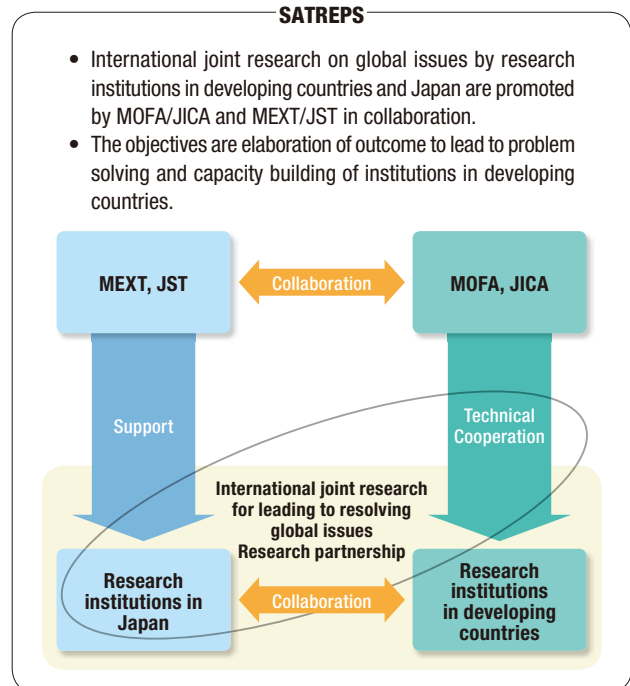
#### 2. Objectives

- 1) Acquire new knowledge leading to resolving global issues and advancing science and technology.
- 2) Build a framework for sustainable activities to contribute to solutions for global issues.
- 3) Improve the development of human resources and self-reliant research capability of developing country.

#### 3. Implementation System

SATREPS is jointly conducted by the Ministry of Foreign Affairs (MOFA), JICA, the Ministry of Education, Science and Culture (MEXT), and the Japan Science and Technology Agency (JST)<sup>2</sup>. In SATREPS, research proposals that are submitted from Japanese research institutions to JST are examined to see if they are consistent with research requests from developing countries (i.e., matching system), from the perspective of science and technology and ODA. Then, adopted proposals come into practice by research institutions in both Japan and developing countries,

#### Implementation System of SATREPS



under the framework of JICA Technical Cooperation Project.

JICA provides support for developing countries conducting the researches (e.g., dispatch of Japanese researchers, acceptance of their researchers, provision of equipment, and local activity expenses). On the other hand, JST supports research activities necessary in Japan or third countries.

#### 4. Eligible Fields of Research

Research objects are four fields: environment and energy, biological resources, disaster prevention, and infectious disease. For the environment and energy field, two research areas, (1) resolution of global-scale environmental issues and (2) advanced energy systems for low carbon society, have been set. Specific research areas in each field are reviewed every year.

### ● Efforts in 2014

#### 1. Selection of Research Projects

From September to October 2013, JICA asked Japanese research institutions for SATREPS research proposals for 2014 and also upon that conducted a survey of developing countries on research requests. As a result, there were 84 matches among 97 proposals and 105 requests, and 10 research proposals were finally selected.

1. Initially, the science and technology cooperation had two schemes; “The Science and Technology Research Partnership for Sustainable Development (SATREPS),” which was a technical assistance project model and “The Dispatch Program for Scientific and Technology Researchers” an individual expert dispatch model. However, the latter was finished in 2012.  
2. With the April 2015 establishment of the Japan Agency for Medical Research and Development (AMED) as an institution to integrally conduct medical research and development in Japan, activities in the field of infectious diseases were transferred from JST to AMED. SATREPS projects in this field are implemented by JICA in cooperation with AMED.

Research proposals adopted include three environment and energy fields (one environment area and two low carbon areas), two biological resources fields, two disaster prevention fields, and three infectious disease fields. Viewed geographically, these proposals consist of seven fields in Asia, two fields in Central and South America, and one field in the Middle East and Europe.

## 2. Implementation Status

With additional 10 proposals, SATREPS has adopted 87 research projects since 2008 when the project started, in cooperation with 41 countries including those in preparation and two new entrants.

Research proposals adopted includes 35 environment

and energy fields, 19 biological resources fields, 16 disaster prevention fields, and 17 infectious disease fields. Viewed geographically, these proposals consist of 49 fields in Asia (39 in South East Asia and the Pacific, one in East Asia, and nine in South Asia), 15 fields in Central and South America, 17 fields in Africa, and six fields in Middle East and Europe. In terms of percentage of the total, the Asian region is the largest with 56%, followed by the African region with 20%.

On the other hand, although 14 collaborative research projects were finished in 2014, SATREPS has produced many results in each field. These outcomes have been contributed to the real world.

### Case Study

## Sudan: Project on Improvement of Food Security in Semiarid Regions of Sudan through Management of Root Parasitic Weeds

### Development of Preventive Methods against *Striga* and Success in Verifying Their Effectiveness

The root parasitic weed known as *Striga* is one of the most serious biological factors that harms the production of grains such as sorghum, a staple food in Sudan. Damage caused by *Striga* has serious effects on Sudanese food security and poverty issues. Research jointly conducted by institutions that include Kobe University and Sudan University of Science and Technology has elucidated the physiological ecology of *Striga*, developed an herbicide, and largely contributed to development of related technologies.

#### The Lives of Approximately 300 Million People Are Estimated to Be Affected

*Striga* is a type of root parasitic weed peculiar to Africa that grows by depriving host plants of nutrition and water, and it is causing serious damage in crop production in semiarid regions. One estimate indicates that approximately 300 million people's lives are affected by *Striga* in Sub-Saharan Africa, including Sudan.

In Sudan, traditional rain-fed agriculture is carried out by small-scale farmers, who

account for the majority of the poor rural population, in an area of 7 million hectares, about half the total acreage under cultivation in the country. It is said that repeated cultivation of the same crop with low input in semiarid conditions is contributing to the increase of *Striga*. A vicious circle is formed, where the small-scale farmers with poor business conditions face greater risks of production decreases.

In this project, which started in 2010, Kobe University represented research institutions in Japan and conducted research on preventive

methods against *Striga* in cooperation with research organizations such as the Sudan University of Science and Technology, and at the same time worked on developing local researchers and engineers in Sudan to be involved in data collection and equipment maintenance.

In the research on preventive methods against *Striga*, the project team focused on the fact that *Striga* seeds germinated only on receiving germination stimulants, and that *Striga* could not live independently without a host plant, and subsequently developed a *Striga* germination stimulant to induce suicidal germination. Through structural determination of strigolactones, which are germination stimulants, the project team identified one of the uniquely synthesized carbamate compounds, T-0101, as a candidate for a germination stimulant that would induce suicidal germination, and in pot and soil experiments, verified the effectiveness of this compound to prevent *Striga* for the first time in the world.

The team also isolated microorganisms from dead *Striga* and soil to develop techniques to prevent *Striga* growth, using bacterial and soil-borne fungus isolated in laboratory and pot experiments. As a result, one of the fungal isolates, called *Fusarium brachygibbosum*, was found to prevent infestation of *Striga* on sorghum. It was further verified in pot experiments that combinations of the application of *Fusarium brachygibbosum* with other preventive measures, such as nitrogen fertilization, bring about higher effectiveness in prevention of *Striga*.

It is expected that the results of the research will be widely shared among farmers through training initiatives such as the Farmer Field Schools organized by Sudanese people, and will lead to practical *Striga* prevention in future.



*Striga* parasitizing sorghum and flowering

A *Striga* pot experiment