**Minutes of 2003 Joint Workshop**
**on FNCA Biofertilizer Project**
**and JSPS-NRCT/DOST/LIPI/VCC Multilateral Cooperative Research Program in the Field of Biotechnology, Development of Biomanure Based on the Symbiotic System**

October 20-24, 2003
Hanoi and Ho-Chi-Minh City, Viet Nam

Following the agreement at the Fourth FNCA Coordinators Meeting in March, 2003 in Okinawa, Japan, the 2003 Joint Workshop on FNCA Biofertilizer Project and JSPS-NRCT/DOST/LIPI/VCC Multilateral Cooperative Research Program in the Field of Biotechnology, Development of Biomanure Based on the Symbiotic Systemtook place as follows,

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| **Date:** | October 20-24, 2003 |
| **Venue:** | **Hanoi**: Sofitel Plaza Hanoi Hotel (October 20-21)<br>**Ho Chi Minh City:** Rex Hotel (October 23-24) |
| **Sponsored By:** | **FNCA:**<br>Ministry of Science, Technology and Environment (MOSTE)<br>**FNCA and JSPS:**<br>Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan |
| **Local Organizer:** | **FNCA (Hanoi):**<br>Vietnam Atomic Energy Commission (VAEC),<br>Vietnam Agricultural Science Institute (VASI)<br>**JSPS (Ho Chi Minh City):** Cantho University |
| **Secretariat:** | **FNCA:** Japan Atomic Industrial Forum Inc. (JAIF)<br>**JSPS:** ICBiotech, Osaka University |
| **Participants:** | **FNCA: 14**<br>**JSPS: 19** |

Opening address was delivered by Dr. Vo Van Thuan, Director of the INST. Dr. Sueo Machi, FNCA Coordinator of Japan, presented “Introduction of FNCA Activities” and Prof. Yoshikatsu Murooka, Osaka University, presented “Introduction of JSPS Cooperative Multilateral Projects Activities”. Dr. Gudni Hardarson presented “Past IAEA Work on the Use of Nuclear Techniques to Enhance Biological Nitrogen Fixation in Grain Legumes”.

Participants made technical visit to the hop thinh commune; tam duong district; vinh phuc province, where they visited the field demonstration of biofertilizer on groundnut and potato and discussed with farmer about the situation of crop production and biofertilizer using. Participants also visited the experiment to valuate the effect of biofertilizer on growth of pine in forestry research and

development center in dai lai commune, me linh district, vinh phuc province. On the field demonstration and experiment all participants can obtain the different in crops growing between biofertilizer treatment and control without biofertilizer, especially the nodulation of groundnut.

The participants appreciated the efforts and guidance of the staff of host organizations.

In Session1 and Session2, after the remarks from Viet Nam and Japan, a total of 8 papers from FNCA participating countries and two invited papers from Viet Nam were presented.

In Session3, a total of 19 oral presentations from JSPS participants were presented.

In Session4, the Special Lectures by Prof. Tadashi Yokoyama, Tokyo University of Agriculture and Technology and Prof. Rachid Serraj, ICRISAT were presented.

In Session5, "Collaboration between FNCA and JSPS Cooperative Multilateral Projects" was discussed. The points discussed and agreed upon were as follows:

The collaboration between FNCA and JSPS would be beneficial to all member states because FNCA and JSPS have related topics-biofertilizer/biomanure, although JSPS focuses more on basic research while FNCA more focuses on practical use. The collaboration between FNCA and JSPS will speed up the identification of established technology from FNCA and JSPS activities and dissemination to the end users. The following proposals are suggested to strengthen the collaboration between FNCA and JSPS:

1. Joint Workshop of FNCA with JSPS will be held occasionally. Joint Workshop with related goals would be of great advantage, as experience and information obtained will be distributed to a wider audience.
2. Scientists from JSPS will be highly welcomed to FNCA workshop (In case joint workshop is not held).
3. More collaboration among scientists from FNCA or JSPS will be developed in each country.
4. Common achievements resulting from FNCA and JSPS activities will be shared, particularly within one country.
5. Published information will be exchanged between FNCA and JSPS.

<Collaboration between FNCA and Other Organizations>

1. Stronger relationship between IAEA and FNCA was proposed. FNCA will

submit a regional proposal on its biofertilizer program to the IAEA and request for possible assistance that could be provided by the Agency.

2. Establishment of relationship with other organizations such as ICRISAT should be encouraged

In Session 6, “General Discussion” and “Review of 2003 and Work Plan for 2004” were discussed. The details of discussion were as follows:

<The plans for 2003: “Improvement of inoculant”>

(1) Suitable carrier

The suitable carrier for microorganisms that can be used as biofertilizer are as follow:

*Rhizobium:* peat, charcoal, sugar filter press cake, soil and aggregated soil, Liquid *rhizobium:* cassava starch

*Associative nitrogen fixing bacteria and plant growth promoting rhizobacteria:* soil, charcoal, sugarcane cake

*Mycorrhiza:* soil, peat, soil + sand, agricultural waste, compost

Suitable carrier can be selected according to the economical, environmental and industrial situations in each country

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(2) Methods of sterilization

- One of the best methods for sterilization of carrier is irradiation. It is required to determine the necessary dose to sterilize the different carriers. To consider the economical view point, it is suggested to use not only the γ-ray but also Electron Beam.
- Radiation sterilization of carrier in suitable package (plastic bag, aluminum pouch) prior to inoculation may be the way to use radiation with low cost.
- It is necessary to study the cost of irradiation in relation to volume of materials.

(3) Mixed culture of inoculant

Mixed inoculant is easy for farmer to apply to the field. Mixing the inoculants just before application is preferable.

- *Rhizobium + VAM*
- *Rhizobium + P. solubilizing microorganism*
- *Associative N fixing bacteria + VAM*
- *Associative N fixing bacteria + P. solubilizing microorganisms*
- *Associative N fixing bacteria + PGPR*

(4) Quality control standard for inoculants

The package of the inoculums should contain the following information

- Name, type, and population of microorganisms

- Type/description of carrier materials
  - Methods of application and crops to be applied
  - Shelf-life/expiry date/date of production
  - Other relevant information

- Population of the guaranteed microorganism(s) is the most important and the population of contaminating microorganisms should be controlled.
- Evaluation methods for the effects of biofertilizers need to be standardized.

<The Topics for 2004 “Improvement of soil microbial activities”>

(1) Improvement of Inoculant

1) Formulation chemicals to be added to the inoculant to ensure survival of biofertilizer organisms

2) Formulation of inoculant
   - Carrier and additives
   - Packaging materials

3) Select effective strains

(2) Improvement of Soil Condition

1) Amendment of problem soils with organic matter application and adjustment of soil pH
   - Application of high C/N ratio organic matter to immobilize soil N for enhancing (nodulation) N-fixation.
   - Application of organic matter as a major component to potting mix for mycorrhizal colonization of plant roots.
   - Neutralize problem soil, acid soil, alkaline or saline soil before applying biofertilizer.

<FNCA Field Demonstration and N-15 Experiments>

As reported by the Project Leader and Experts from Japan in the 2002 Workshop, the field demonstration of application of biofertilizer on crops was accepted. In 2003 Workshop each participating countries reported the field experiments conducted as planned, these reports attached.

A few of these experiments involved the use of nuclear technique such as $^{15}N$ and $^{32}P$ to measure the efficiency of nutrient uptake.

<FNCA Biofertilizer Manual>

The FNCA group from Japan will provide materials for the manual in the first edition. This will subsequently have additional information from member countries. The following are the suggested topics:

1) Microbial strains selection
2) Biomass production
3) Carrier selection and processing
4) Inoculant production
5) Quality control
6) Methods of application

<Use of Irradiation for carrier sterilization>

Some countries such as China, Indonesia and Malaysia have experience on the use of irradiation to sterilize carrier materials for biofertilizer. At present, irradiation is rather expensive as compared to the autoclave or heat sterilization and more studies need to be conducted on the suitability of irradiation for sterilization in terms of economics. Radiation sterilization of carriers however, has clear advantage as follows. Radiation can sterilize or disinfect carriers at room temperature, so that no change in properties, composition and morphology takes places. Carrier can be sterilized in bags followed by injection of bacteria without any bacterial contamination, which leads better quality of biofertilizer.

<FNCA Web Site and Biofertilizer Mailing List, “BF-info”>

Topic on biofertilizer web-site was presented by Prof. Ohyama of Japan. He introduced htpp://www.fnca.jp/english/ as the official web-site. The web-site contains “Project Review”, “Introduction of Project Leaders”, “Workshop”, “Biofertilizer Group News Letter”, “Who’s Who in Biofertilizer” and “Bulletin Board System (BBS)”. The web-site was constructed so that participants can easily and directly contact each other and to have an easy exchange of information among researchers, producers, farmers etc. about biofertilizer. A total of 114 mailing addresses were already registered in the Biofertilizer Mailing List “BF-info”. Everybody was invited to register their mailing addresses in section “Who’s Who in Biofertilizer” especially those who have not yet registered. The web-site will be updated periodically. Each participating country was encouraged to contribute publications to “BF-info”.

<Next Workshop>

The place of next Workshop would be discussed among the participating countries through the Coordinators in each country at the Fifth Coordinators Meeting to be held in Tokyo in March 2004. The possibility to hold the Joint Workshop with JSPS would be also discussed.

<Biofertilizer Group Newsletters>

Newsletter No.4 would be issued on April 2004 by Vietnam and No.5 on July, 2004 by Malaysia

During the Workshop, “Strategy for Extension of Bio-fertilizer” was discussed. (Attachment 1)

The Minutes were discussed and agreed upon by all participants in the Workshop. This will be reported at the Fifth FNCA Coordinators Meeting to be held in March 2004 in Tokyo, Japan.