Annex 4. Parallel Session Summary on Biofertilizer Project

Parallel Session Summary on Biofertilizer Project

At the beginning of Session, Dr. Reynaldo V. Ebora, Director of National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños (UPLB), delivered welcome remarks.

Session 3 Achievement and Challenges of the Project

I. Application of Radiation Sterilization of Carriers and Challenges

Dr. Issay Narumi, Japan Atomic Energy Agency (JAEA) delivered a lead speech and introduced the effect of carrier sterilization (gamma-irradiation, autoclaving and non-sterilized control) on inoculant survival during storage period. Gamma-irradiation or autoclaving maintained the cell density of *Rhizobium* greater than the initial cell density after 6-month storage, while the cell density was significantly decreased in biofertilizers made from non-sterilized carriers. In some cases, depending on carrier materials used, gamma-sterilization was superior to autoclave-sterilization in enhancing the inoculant's survival. Indonesia and Thailand reported that autoclave-sterilization of carriers showed a deleterious effect on survival of *Azospirillum*, whereas gamma-irradiation did not.

II. Developing a FNCA Manual for Quality Standard of Biofertilizer

Dr. Sompong Meunchang, Department of Agriculture of Thailand (DOA) and Dr. Shotaro Ando, National Agriculture and Food Research Organization (NARO), delivered a lead speech respectively. New Fertilizer Act including biofertilizer and Biofertilizer Quality Standard of Thailand were introduced. The evaluation method of microbial materials for agriculture, which was proposed by the expert committee on microbial materials of Japanese Society of Soil Science and Plant Nutrition, was also introduced. The importance of quality standard of biofertilizer to promote the biofertilizer use was confirmed among the members of biofertilizer project and it was agreed that QC manual of biofertilizer will be edited based on the QC manual of biofertilizer of Thailand.

III. Development of Multi-functional Biofertilizer (Containing Selection of Suitable Kinds of Microorganism and Selection of Plants and Soil/Area for Effective Application of Biofertilizer)

Three lead speeches were delivered by Dr. Masataka Aino, Hyogo Prefectural Technology Center for Agriculture, Forestry and Fisheries, Dr. Sompong Meunchang, Department of Agriculture (DOA), and Dr. Pham Van Toan, Ministry of Agriculture and Rural Development of Vietnam (MARD) and Project Leaders from 5 countries also presented the progress report. Different kinds of works on the development of multi-functional biofertilizers that have multi-effects on the growth, nutrition uptake of plant as well as reduction of plant disease were reported.

China: Many kinds of inoculation test using different soils, different crops and different strains were carried out. Phosphate-solublizing bacteria of P2-1A + nitrogen fixing bacteria of RN5 gave a promising growth effect to soybean at black soil.

Indonesia: For vegetables cultivated in the highland area with high soil organic matter, mixed inoculant of Azotobacter in combination with 50% compost was more effective than application as single inoculant. In case of carrot, it was observed that fresh weight increase 47% vs 29 %, respectively. While increase in fresh weight in application of 100% compost was 20%.

Bio-organic fertilizer (organic fertilizer enriched with beneficial soil microbes namely Azotobacter, Azospirillum and phosphate solubilizing microbes) was tested to evaluate the ability of bio-organic fertilizer to replace partly inorganic NPK fertilizer for rice growth. We found that bio-organic fertilizer (300kg/ha) was able to replace 150kg of the inorganic NPK fertilizer needed by rice. No significant differenceint rice yield between treatment 100% inorganic NPK fertilizer (300kg/ha) with treatment 300kg/ha bio-organic fertilizer plus 150kg/ha inorganic NPK fertilizer.

Japan: Improvements of *Bradyrhizobium* and endophytic bacteria using ion beams were carried out. In case of improvement of *Bradyrhizobium* in terms of high temperature tolerance, several candidates surviving at 45°C were obtained. In case of improvement of endophytic bacteria in terms of antagonism against the tomato bacterial wilt, many useful mutants were obtained.

Malaysia: The additional effect of 'nitrogen-fixing activity' of selected multifunctional bacteria (phosphate-solubilizing, plant growth promoting and antagonism to bacterial wilt) applied to several kinds of vegetables was evaluated using the ^{15}N isotopic tracer technique, and high level of contribution of N_2 fixation was observed. The data were discussed and it was suggested that further experiments should be carried out to confirm the data.

The Philippines: Confirmatory studies on the efficacy of Bio-N for high value solanaceous crops and sugarcane were conducted. The first set up was testing on the efficacy of Bio-N for tomato (cv. Diamante), integration of Bio inoculants namely Bio-N, Bio Groe and Mykovam in combination with chemical fertilizers. The result of the data for the efficacy trial for hybrid tomato (cv. Diamante) showed the highest yield with plants applied with full chemical fertilizer producing 7.69 tons per hectare, followed by plants inoculated with Bio-N in combination of the 1/2 recommended rate of chemical fertilizers. Lowest yield was observed on the control and Bio-N alone. Another experiment was conducted for sugarcane to be used for securing permit for registration.

Thailand: Multifunctional biofertilizer with co-inoculants of *Azospirillum* and *Bradyrhizobium* for leguminous plants are developing. At first, to select effective strains, *Azospirillum* isolates which respond with *Bradyrhizobium* specific for vegetable soybean were screened by pot and field experiments. The effectiveness of co-inoculation was confirmed in this study.

Viet Nam: Based on physical and chemical properties, and relationship between microbes and plant, many kinds of microbes having abilities of nitrogen fixing, dissolving phosphorus

and potassium, and so forth.

IV. Commercial Application of Biofertilizer and Challenges

Dr. Khairuddin Bin Abdul Rahim, Malaysian Nuclear Agency (Nuclear Malaysia) delivered a lead speech and reported that although highly dependent on chemical fertilizers for decades, the Malaysian agricultural sector is presently giving organic fertilizer and biofertilizers due recognition. This is partly due to market demand and government supports for green technology. The numbers of companies producing biofertilizers of good qualities are increasing. The plantation industries of oil palm and rubber and to a lesser extent, of fruit trees and herbal plants, are at present embarking on their own to produce biofertilizer products. There is great potential for improved commercialization of indigenous biofertilizer products in Malaysia. Biofertilizer commercialization has been going on in the several countries. In Indonesia, companies have been using gamma-ray irradiation to carriers in their biofertilizer production, as well as Malaysia. Since companies may not only need finished product in transfer of technology or commercialization process, it is difficult to commercialize products developed in national institute. We need to promote outputs from national institute through seminar, roadshows, exhibition, and media.

V. Application of Biofertilizer with Plant Growth Promoter of Oligo-chitosan

Dr. Masataka Aino, Hyogo Prefectural Technology Center for Agriculture, Forestry and Fisheries delivered a lead speech for application of oligo-chitosan to biofertilizer. Chitosan is naturally-occurring compound and oligo-chitosan has potential to control plant diseases. These molecules inhibit fungal growth and development. According to Dr. Aino's presentation, the combination with oligo-chitosan and Live Coat (Cell-nae-genki) was not more practical, when treated at same time. However, when treated with oligo-chitosan at one day before transplant to soil contaminated by the pathogen, suppression effect against tomato bacterial wilt was much higher than those in the individually-treated. It was supposed that oligo-chitosan induced resistance for seedling treated with bio-pesticide strongly. We concluded that the effect of oligo-chitosan with biofertilizer would be investigated.

Session 4 Special Talk on Sustainable Agriculture and Biofertilizer in the Philippines

Dr. Mercedes Umali Garcia, University of the Philippines, Los Banos

A source of biologically fixed nitrogen through the associative system has been developed at the National Institute of Molecular Biology and Biotechnology (BIOTECH), UPLB with a brand name Bio-N. Bio-N is a microbial-based fertilizer that was isolated from the roots of Talahib (*Saccharum spontaneum* L.*)* and contains *Azospirillum* as its major component with soil and charcoal as its carrier. Bio-N has been extensively tested in different varieties of rice and corn in various areas nationwide before its commercialization in 2002. Performance of Bio-N based on numerous studies and experience of current users of the product has shown that it could significantly increase production with decreasing cost. The development of microbial inoculants for enhanced plant growth and yield is already accepted and utilized by

the Filipino farmers. BIOTECH had successfully transferred the technology through the establishment of mixing plants with the support of the Department of Agriculture.

Session 5　Activity Plan in 2011

Dr. Tadashi Yokoyama, Tokyo University of Agriculture and Technology (TUAT) delivered a lead speech and summarized the project review for 2007-2010 and activity plan for 2011, on each topic in Session 3. All participants discussed the topics and made a summary for the parallel session on Biofertilizer Project.