Annex 3. Session Summary

Session Summary of FNCA JFY2014 Workshop on Mutation Breeding Project

Session 1 Report on 2014 for Project on Mutation Breeding of Rice for Sustainable Agriculture

Eight member countries presented their report on 2014 for Project on Mutation Breeding of Rice for Sustainable Agriculture. The brief summaries are as follows:

Bangladesh (Dr. A.N.K. Mamun, BAEC)

Some display fields of BINA Dhan -14 were cultivated for farmer with the help of agriculture extension in the different area of Bangladesh. Farmers are becoming more and more interested to cultivate this new mutant variety with good agronomic characters. Finally two (one boro and another T.Aman) advance mutant lines are selected from the mutants lines of BARRI dhan 29. Some promising mutant lines are selected from the mutants lines of NERICA 10 and other rain fed rice. Four land races of rice collected from the southern part (costal area) of Bangladesh called Lombur, Kalam Paijam, Agaro and Hori dhan, planed to irradiated these seeds for further experiments.

China (Prof. Shu Qingyao, ZU)

Four elite rice lines were radiated by high energy ions including $^{12}C^{6+}$, $^{16}O^{8-}$, and $^{20}Ne^{10+}$, together with Cobalt-60 gamma rays and M_2 populations were raised and screened, which resulted in the identification of five mutant lines with improved agronomic traits (plant height, heading time). Meanwhile, next generation sequencing techniques were applied for investigation of genomic changes induced by gamma rays and a number of findings were made regarding the frequency, type and location of mutations induced in rice.

Indonesia (Dr. Sobrizal, BATAN)

Through 200 Gy irradiated SKI 64, SKI 88, SKI 153 and SKI 276 lines, 12 homogeneous early maturity M_7 mutant lines were selected. Based on result of trial on wet season of 2013/2014, growth duration of these 12 lines were ranging from 94.3 to 100.3 days from sowing to harvesting, significantly shorter than those of check varieties. These result confirmed result of previous trial on dry season of 2013. In both growing seasons, even though growth duration of all mutant lines were significantly shorter than those of check varieties, the yield of seven mutants (RSKI 64-1, 64-2, 88-1, 88-3, 88-7, 153-1, 276-1) were not significantly difference. All lines wil be subjected to multi-location yield trials and other examinations such as pests, diseases and qualities as requirements of variety release.

Malaysia (Dr. Sobri Bin Hussein, Nuclear Malaysia)

a) Agronomic package for water stress condition and disease resistance mutant line (MR219-9) will be introduced to the farmer.
b) Further evaluation of quality and specialty rice from MR219 mutant line will be conducted

c) Development of blast mutant line through marker assisted selection (MAS) MR 264 x PS2 will be further evaluated.

Mongolia (Dr. Bayarsukh Noov, PSARTI)

Progress on the improvement of wheat, barley varieties through mutation breeding in Mongolia

The major objectives of breeding program were the selection and evaluation new varieties with high yield and early maturity which are adaptable agro-ecological condition. During project implementation in 2013-2014 over 2700 mutant progenies developed and screened through nd **lines** -527, 547, 561 are developed. In 2013, Darkhan-172 mutant variety transferrebreeding plots under rainfed and irrigated conditions for yield performance. Advanced mutant varieties including Darkhan-172, Darkhan-173, Darkhan-175, Darkhan-106, Darkhan-196 ad to the State Variety Test for multi-location trial for release. Also, new mutant varieties Darkhan-172, Darkhan-173, Darkhan-106 and Darkhan-141 are used for hybridization with rust resistant varieties Anza, Kern, Yecoro rojo for the improvement of rust disease resistance in wheat and developed 11 combinations in F_2.

The mutation breeding on barley varieties initiated successfully. Optimal dose of naked barley variety Alag-Erdene was 200Gy, but in the malting variety Burkhant-1 was 250Gy determined.

The Philippines (Ms. Adelaida C. Barrida, PNRI)

Two traditional rice varieties, Umangan and Native borie were used as the breeding materials for this study. Seeds of these varieties were irradiated with 200 and 300Gy gamma rays. Application of organic and biofertilizers and spraying of carrageanan as growth promoter for sustainable agriculture were done. Results in the M_2 generation showed increase on the number of tillers per plant as well as on the number of seeds per panicle in variety Umangan on those irradiated with 300Gy and sprayed with carrageanan. Meanwhile in variety Native borie increase on the number of tillers per plant was observed on irradiated plants. Selection of lines with desirable agronomic traits such as early flowering, short, high tillering, long panicle and high yielding was done on the segregating population of M_2 plants.

Thailand (Dr. Suniyom Taprab, RD)

In 2014, M_3 of other 6 varieties consisted of 4 deep water rice varieties and 2 floating rice varieties were tested on their anaerobic germination ability (AG). AG ability was classified to 3 levels of tolerant (76-100% survival), intermediate (51-75% survival) and susceptible (0-50% survival) levels. M_3-lines of lowland rice variety, Khao Hlan On, could not retain its AG ability and white pericarp. It might be abnormality or no mutation. AG ability of M_3-lines of deep water rice variety namely Prachinburi1 and floating rice namely Khao Ban Na 432 were not differed from their wild types where it showed same survival percentage. M_3-lines of Ayuttaya1, Prachinburi2, RD45 and Plai Ngam Prachinburi gave high survival percentage and were classified to be tolerant mutants while their wild types were susceptible. M3-lines of Prachinburi1 and Khao Banna432 were also classified to be as same tolerant as their wild types. We concluded that gamma ray irradiation could not induced anaerobic germination ability in Khao Hlan On, Prachinburi1 and Khao Banna432. They could be directly used to be AG tolerant donors in breeding program

Vietnam (Dr. Le Huy Ham, AGI)

1. Results of gamma irradiation: Dry seeds of three varieties BT62.1 with *Xa7, Xa21* genes; P5.3 with *Piz* gene and BT3.1 with *saltol* gene were irradiated with 300 grey. In M4 progenies using MAS, innoculation in laboratory and field evaluation were sellected 20 mutants with good agronomic characteristics as resistance to bacterial leaf blight resistance, blast resistance, salt tolerance and with short duration, good quality as original varieties but with higher yield than the original ones.

2. Results of ion beam irradiation: Two rice line CMBT (carrying *saltol* gene) and BLBT (carrying *Xa7, Xa21* genes) seeds were treated with Carbon ion radiation (40 and 60 Gy). Fourteen M4 promising mutant lines derived from dose 60 Gy were selected via MAS and innoculation and testing in laboratory. All of these lines showed good resistance to bacterial leaf blight and salt tolerance in the green house. Field testing showed that they have higher yield than the original varieties while attained good characteristics from parents.

These lines are suggested for further evaluation.

Session 2　Follow-up for Sub-project on Banana, Orchid, Sorghum and Soybean

Follow-up reports on the Sub-projects in Banana, Orchid and Sorghum and Soybean were presented respectively. The summaries are as follows:

1. Sub-project on Drought Tolerance in Sorghum and Soybean
(Dr. Sobrizal, BATAN, Indonesia)

During the periode of 2014, 2 sorghum and 2 soybean varieties released by BATAN with the name of Samurai 1, Samurai 2 and Mutiara 2, Mutiara 3, respectively. Based on various examinations, some characters of released varieties such as grain yield, grain qualities and pest and disease resistances were beter than those of check varieties. All sorghum and soybean as well as rice varieties released by BATAN have been growing largely and given significant economy impacts to famers in Indonesia.

2. Sub-project on Insect Resistance in Orchid
(Dr. Sobri Bin Hussein, Nuclear Malaysia, Malaysia)

Industrial collaborators in Malaysia are mainly dependent on government funds to carry out commercialization studies on R&D products and the funding is given for an average of 2 years. If the products fail to reach the market in 2 years, the company will have to utilize its own resources to continue the project. This is especially difficult for plants as they require longer time to grow and are amenable to various environment factors.

3. Sub-project on Disease Resistance in Banana
(Ms. Adelaida C. Barrida, PNRI, the Philippines)

<u>Multi-Location Performance Evaluation of A New Banana Bunchy Top Virus (BBTV) – Resistant 'Lakatan' Cultivar</u>

This project aims to make 'Lakatan' banana production more profitable to small farmers by reducing losses due to banana bunchy top virus infection by 20% through adoption of disease resistant cultivars. The major activities conducted from April 2013 to September 2014 were mass propagation of 'Lakatan' mutant lines, field establishment of multi-location evaluation and demonstration trials and monitoring of BBTV disease incidence in trial sites. From December 2013 to September 2014 (constitutes Year 2), the project was able to disseminate 7,420 ready-to-plant materials and 1,720 meriplants mostly for field demonstration trials. Farmers' meeting, seminar, and consultation was done from Aug 2013 – Oct 2013 in Laguna, Cagayan and Isabela and 2 seminars involving Lakatan banana production, disease management, laboratory and field visits were held at IPB on Jan and May 2014