Annex 4. Session Summary

Session Summary of FNCA JFY2013 Workshop on Mutation Breeding Project

Session 1 Report on 2013 and Plan for Project on Mutation Breeding of Rice for Sustainable Agriculture

Eight Member Countries presented their report on 2013 and plan for Project on Mutation Breeding of Rice for Sustainable Agriculture. The brief summaries are as follows:

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

On August 26, 13 carbon ion beam mutated variety BINA dhan-14 got official approval for releasing its seeds at farmers' level for mass cultivation at a meeting of the National Seed Board. Finally, the mutant RM(2)-40(C)-4-2-8 produced the highest yield (6.94 t/ha) and took 156 days to mature which was 5 days earlier than its parent BRRI dhan29. Seeds of Kasalath and NERICA-10 were exposed to carbon ion beams. Some very conspicuous and abrupt changes were at 40-200 Gy doses include change in seed colour, seed sizes, plat stature, maturity etc.

China (Dr. Shu Qingyao, ZU)

1. The project aims at developing mutant rice germplasm for breeding and production of hybrid rice using both gamma rays and high energy ion beam irradiation
2. Five mutation populations of PGMS lines and restorer lines were develped and screened for important traits, however, no useful mutant was identified.
3. Molecular genetic analysis of previously identified mutants revealed that DNA mythylation can be one of the mechanisms leading to phenotypic mutations.

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. Yields of ten mutant lines (RSKI 64-1, RSKI 64-2, RSKI 88-1, RSKI 88-2, RSKI 88-3, RSKI 88-4, RSKI 88-5, RSKI 88-7, ESKI 153-1, RSKI 276-1, RSKI 276-2) were ranging from 8.25 to 9.79 t/ha. They were significantly higher than that of INPARI 13, but not significantly difference with those of original line, SKI 88 and national leading variety, Ciherang. Growth durations of these lines were ranging from 94.3 to 99.3 days from sowing to harvesting. They were significantly shorter than that of the national leading early maturity, INPARI 13. Therefore these ten mutant lines should be continued to next examinations such as multi-location yield trials, pests, diseases and rice quality examinations, before release as new varieties.

Japan (Dr. Atsushi Tanaka, JAEA)

In order to obtain high yield rice mutants from primary varieties, comprehensive analysis of yield component traits has been carried out. Among the 319 fixed type mutants obtained from gamma-ray, ion-beam, and EMS treatments, only a few showed larger type mutants, but not a few

mutants showed a high value of kernel weight, grain number per panicle or panicle weight.

Malaysia (Dr. Sobri Bin Hussein, Nuclear Malaysia)

In this study, it was found that mutant line ML21 had the best performance in majority of yield components and vegetative traits as compared to others mutant lines and parental variety. Moreover, the determination of nutritional composition also showed that mutant lines namely ML31, ML21, ML10, ML19 were improved in crude protein content, dietary fibre and carbohydrate content than their parental variety, MR219. Two mutants, ML3 and ML30, were identified to have moderate glycemic index. As low and moderate GI foods are recommended for diabetic patient, these two mutants have high potential for their consumption.

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

Project: Grain Quality Improvement in Rice(Oryza sativa L.) through Induced Mutation Breeding

Analysis of amylose content was continuously done to further determine those lines that exhibited low to intermediate amylose content and for confirmation and selection. Amylose content of selected putative mutant lines in the M_7 generation were determined using the quantitative method. Mutant lines with low to intermediate amylose contents were selected on plants irradiated with 200 and 300 Gy gamma rays using this method. The control and the check variety belong to high amylose content. Confirmation of these results was done using the molecular technique at M_8 generation.

Thailand (Dr. Suniyom Taprab, RD)

In 2013, local deep water rice varieties were induced mutation through gamma ray irradiation. Their morphological traits and agronomic characters of M_1 - M_2 were observed against their wild types. Their M_3 progenies will be screened for tolerance to submergence, anaerobic germination and internode elongation ability. One variety namely Khao Hlan On, had good performance in aerobic germination. It originally had white colored pericarb while its 263 mutants had red colored pericarb. Sixty mutant lines out of those 263 mutants had been tested for anaerobic germination compared to IR42 (susceptible check). It was found that, seventeen mutants had 100% germination under anaerobic condition.

Vietnam (Ms. Dao Thi Thanh Bang, AGI)

Mutation breeding is powerful tool for rice breeding improvement. By gamma ray irradiation treatment, mutant rice variety DT39 Quelam has improved in productivity for high yield, better quality and tolerant to bacterial leaves blight. Moreover, DT39 gave high nutrition content such as iron, zinc, Kali and Maggie in comparison to origin variety. By carbon ion beam irradiation on Bac thom and Khang dan varieties, there were many types of variations in M_2 generation at the dose of 40 and 60Gy. In M_7 generation of Bacthom mutant line showed that a range of variation of cooking quality some mutant lines are soft some other very hard in cooked rice. Two elite mutant lines which have good quality and reasonable productivity have chosen for further evaluation on agriculture characteristics.

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. Soeranto Human, BATAN, Indonesia)

1-1 Sorghum

Mutation breeding for drought tolerance of sorghum and soybean had been included in the FNCA project FY2002 – Fy2006. Induced mutations in sorghum and soybean were done using gamma irradiation, and some promising mutant lines were produced. For sorghum, 3 mutant varieties had been released as new varieties given the name of Pahat, Samurai-1 and Samurai-2, respectively. Major advantages for farmers by these new varieties could be Increasing land productivity especially during dry seasons, Incrasing biomass production (forage) for animal feed, producing alternative food and reducing malnutrition in poor areas, improving soil properties and increasing famers' income. Sorghum has been grown by farmers and private companies but still in limited areas (mostly Central Java, NTB, NTT and South Sulawesi Provinces), Recently, more and more companies asking for sorghum seeds for cultivation and used it either as food, feed or liquid sugar (for bioethanol). Sorghum technology needs to be socialized to communities/ stake holders including farmers and industries. Socialization has been done through education, and also through different activities such as training, seminar, workshop, sorghum demplots etc.

1-2. Soybean

For soybean, 3 mutant varieties had been released during the period of FNCA project, given the name of Rajabasa, Mitani and Mutiara. Just recently the other two mutant varieties of soybean were released by the name of Gammasugen-1 and Gammasugen-2, respectively. Major advantages for farmers by new varieties could be more choice of soybean varieties, increasing soybean yield, improving crop rotation patern and increasing famers' income. The soybean mutant varieties i.e. Rajabasa, Mitani and Mutiara had been grown widely in almost all Provinces. Meanwhile, seed multiplication for the new mutant varieties "Gammasugen-1" and "Gammasugen-2" were is still underway. Future strategy for further extension among farmers would include soybean socialization through the Center for Dissemination and Partnership, BATAN. Right now our soybean seeds has been included in National Soybean Seed Supply (by the National Seed Board) for distribution thoughout Indonesia.

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

The project on "Induction of Insect Resistance in Orchids" was officially ended in 2009 and has generated 1 mutant of *D. mirbellianum* tolerant to mite and thrips and 2 mutants of *D.jayakarta* tolerant to thrips. The mutants have been propagated and planted at Nuclear Malaysia's glasshouse and Hexagon Green's field nursery. The mutants are however are more suitable for potted plants and therefore will be distributed to interested growers for local market.

3. Sub-project on Disease Resistance in Banana

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

Project: Multi-location Performance Evaluation and Commercialization of a New Banana Bunchy Top Virus (BBTV)-Resistant Lakatan Cultivar

Multi-location agronomic, yield and economic performance evaluation were undertaken. 14 performance trials in Region 2 (2), Region 4 (11) and region 11 (1) and 20 demonstration trials in Region 2 (4), Region 3 (1) Region 4A&B (15) and region 11 (1) were established. Training of 100 farmers and farmer-cooperators in establishing the trial sites, growing tissue cultured mutant Lakatan and BBTV control and management was also done. Monitoring of percent survival of transplanted resistant Lakatan and the occurrence of BBTD in the trial sites and micropropagation of more than 20,000 plants of mutant lines for trials and dissemination were accomplished.