Annex 3. Session Summary

Session Summary of
FNCA 2017 Workshop on Mutation Breeding Project

Session 1 Follow-up on Sub-project on Sorghum & Soybean, and Banana

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

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

So far, 3 sorghum and 10 soybean varieties have been released by BATAN, and they have grown largely with total growing area in 2016 for Sorghum 1.600 Ha, for soybean 600 Ha. Recently, soybean variety Mutiara 1 has been selected and used as the basis for national self-sufficiency plan, which aims to increase food security in the country. To increase the domestic production in coming years Mutiara 1 seeds are being mass-produced and distributed to farmers. In addition, some sorghum mutant lines with high grain yield and biomass production, and some soybeans mutant lines with drought tolerance and early maturity have been developed and will be submitted to national variety release committee for evaluation.

2. Sub-project on Disease Resistance in Banana
(Ms. Ana Maria S. Veluz, PNRI, the Philippines)

The project's main objective aims to make "Lakatan" banana production more profitable to small farmers by reducing losses due to Banana Bunchy Top Virus (BBTV) infection by 20% through adoption of disease resistant cultivars. This was successfully attained as part of the integrated management strategies against BBTV through the development of BBTV resistant Lakatan by gamma-irradiation. Based on several disease reaction parameters used 5 mutant lines namely lines 9-28-2(SAGANA 1), 9-28-3(SAGANA2), 13-30-2(SAGANA 3), 22-28-2(SAGANA 4) and 28-30-2(SAGANA 5) were selected and evaluated in multi-locations trial like Luzon, Visayan and Mindanao. These 5 mutant lines called HIBRID LAKATAN or Highly Improved Banana through Radiation Induced Technology were recommended for registration as new Lakatan variety with 5 lines to the National Seed Industry Council of the Philippines (NSIC) and waiting for the release of its recommendation anytime this year.

Session 2 Country Report on Application of Mutation Breeding of Rice for Sustainable Agriculture

Nine member countries presented current progress and activity summary for 5 years on the application of mutation breeding of rice for sustainable agriculture. The brief summaries are

as follows:

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

BINA Dhan -14 is becoming more and more popular to farmer in the different area of Bangladesh and cultivation area is also increasing. Mutant line is irradiated with carbon ion beam and selected as a mutant line from BRRI dhan 29 and named as BINA Dhan -18. This high yielding early mature line is released as new mutant variety in 2016. Recently another variety called BINA Dhan-19 is also released this year of 2017 from the parent variety NARICA-10. This mutant variety is selected from the seeds of NERICA-10 variety of rice and irradiated with 40 Gy carbon ion beams from QST Takashaki in 2013. This new variety can be cultivated in rain-fed condition in both AUS and Aman season in Bangladesh.

China (Dr. Huang Jianzhong, ZU)

By applying gamma-irradiation and related biotechnologies: we obtained ten mutants including three early maturing mutants, two putative blast resistant mutants, two low phytic acid mutants and one *xantha* revertant. An HRM-based TILLING system suitable for fast and high-throughput screening of indel mutations was established by combining HRM analysis and gamma mutagenesis. We identified three mutated genes and further elucidated the functions and underlying mechanisms in the mutants: one epigenetic mutation of the *OsGUN4* and its reversion mutant *OsGluTR*, one lesion mimic mutation of *CYP81A1*.

Indonesia (Dr. Sobrizal, BATAN)

Twelve promising mutant lines with high yields and early maturities have been developed through a wide cross and mutation breeding program. The growth durations of these mutant lines were ranging from 93.7 to 99.3 days from sowing to harvesting, significantly shorter than those of original line SKI 88, national leading variety Ciherang and the early maturity national leading variety INPARI 13. Yield of most mutant lines were not significantly difference with that of original line, SKI 88 and national leading variety, Ciherang, but significantly higher than that of INPARI 13. To fulfill the requirement of variety release in Indonesia, other multi-location yield trials and other examinations such as pests, diseases as well as other grain quality examinations should be conducted.

Japan (Prof. Hirokazu Nakai, Shizuoka University)

Breeding for adaptability to low input sustainable agriculture using mutant lines with high resistance to bacterial leaf blight has been continued for 13 years. In 2017, it was confirmed that some selected lines had significantly higher grain yield and better eating quality as well as adaptability to the conditions of tropical Asian countries. In the cross breeding in several place across in Japan, some mutant lines showed higher yield combined with good eating quality. It is expected that they will be irradiated by gamma-ray and ion beams to remove unfavorable characters.

Korea (Dr. Kang Si-Yong, KAERI)

A new mutant rice variety with salt tolerant, Wonhae-2, was derived from an *in vitro* mutagenized population of Dongan induced by 70 Gy gamma ray irradiation. The mutant with elevated salt tolerance was selected to salt stress through seedling, pot and reclaimed soil test at various growth stage of M2-M4 generation. Tocomi-1' and 'Tocohongmi', new japonica rice cultivars derived from a 300 Gy gamma ray irradiation with high tocopherol content and red- brown pericarp. Among them, 'Tocomi-1' was officially registered by the Korea Seed and Variety Service after 2-years field evaluation test and then transferred a private company, "Seedpia" for commercialization.

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Malaysia (Dr. Sobri Bin Hussein, Nuclear Malaysia)

FNCA Mutation breeding project has been selected as one of the high impact projects with low cost involved. The first meeting with secretary general (MOSTI) was held on 20 Feb 2017 and followed by technical meeting with Deputy Director General MARDI on 15 March 2017. In the meantime, NMR 152 (PVBT 027/15) sample has been submitted to Malaysian Agriculture Research and Development Institute MARDI on 18 Sep 2017 to initiate the legalization/certification process.

The Philippine (Ms. Ana Maria S. Veluz, PNRI)

This project aims to develop mutants with improved agronomic characteristics by gamma irradiation that can adapt to organic farming. Gamma irradiation significantly reduced the number of days to flowering and increased the number of tillers/plant in both the irradiated plants (200Gy and 300Gy) of the a traditional rice varieties, Umangan and Native Borie, at M_3 generation while reduction in plant height at maturity for Native Borie in both irradiated ones (200Gy and 300Gy) was observed. The addition of carrageenan as plant growth promoter for the 2 rice varieties and soaking in biofertilizer enhanced the flowering and production of tillers when applied at the right time and concentration. Selected potential mutant lines from M_3 generation are being grown as M_4 generation and further evaluation and selection of promising mutant lines responsive to organic farming will be undertaken for the M_4 generation.

Thailand (Dr. Kanchana Klakhaeng, RD)

Three induced mutant rice varieties in Thailand are RD6, RD15 and RD10 which were still well accepted by farmers and consumers worldwide. Promising lines of mutants rice were identified as submergence tolerance and anaerobic germination ability. More information is needed from M5 plants for further conclusions.

Vietnam (Dr. Le Huy Ham, AGI)

During FNCA forum 2007-2017 have been released 10 rice mutant varieties. Some of them became very popular variety like Khang Dan mutant, DT80. By using ion beam for

irradiation have been derived number of promising lines which are now are being tested in the filed conditions. Combination of mutation and molecular marker for rice breeding become routin in rice breeding, thus shorten time and improve selection efficiency.