ANNEX 4

Part B. Summary of Country Reports on Super Water Absorbent (SWA)

Part B-1. Country Report on Hydrogel SWA

(1) Bangladesh (Dr Salma Sultana, Bangladesh Atomic Energy Commission (BAEC))

Super water absorbent (SWA) was prepared from the combination of rice husk, acrylic acid, sodium hydroxide solution and CMC solution by the application of gamma radiation. The use of prepared SWA in sandy loam soil on tomato plant increased the morphological values i.e., plant height, number of flowers, number of fruits, weight of fruits with compared to control. The yield of tomato in terms of t/ha with SWA, combination of SWA & o-chitosan, o-chitosan and control are 106, 111, 133, and 48.75 respectively. The treatment of SWA and a combination treatment of SWA with oligo-chitosan on tomato plant in sandy loam soil can reduce watering frequency from once a day to three times a week during the dry season. In the case of eggplant the use of SWA also increased the morphological values i.e., plant height, number of flowers, number of fruits, weight of fruits, length of fruits with compared to control. The use of SWA on eggplant in sandy loam soil also can reduce watering frequency from once a day to twice a week during the dry season. The yield of eggplant is not ready yet. The work is going on.

(2) Indonesia (Ms Ms Tita Puspitasari, National Nuclear Energy Agency (BATAN))

1. Hydrogel cassava-co-acrylate SWA prepared by gamma irradiation at 15 kGy has high water swelling up to 300 times of its dry weight
2. Hydrogel cassava-co-acrylate SWA improve water irrigation efficiency on shallot plant and chili in sandy soil from twice a day to twice a week during the dry season/off season
3. The use of SWA on chili plant in tailing model soil can increase height of plant, number of leaves and weight of leaves of chili plant as much as 36.3 %, 26.7 % and 30.4 % respectively.
4. Combination treatment of SWA and oligochitosan and watering as much as twice a week throughout the shallot crop cultivation gives the best performance.
5. The use of SWA in sandy soil on shallot and chili crops is a supporting technology for improved soil moisture and soil amelioration in marginal sand (nutrient-poor) and relatively easy to dryness (very porous soil structure).
6. Combination treatmen of SWA and oligochitosan for chili plant at sandy soil is effective in increasing of yield, number of shoot and reduce disease

(3) Kazakhstan (Mr Sergey Kotov, JSC "Park of Nuclear Technologies")

The small scale production of SWA is based on Acrylic acid and KOH. The Field tests are carried out together with the Institute of forestry of Kazakhstan. The tests will last up to 2017. The first results show survival increase for balsam poplar from 80 to 99%. There is an arrangement with the"Astana Zelenstroy" LLP on carrying out pot tests on city flowerpots in Astana. There is an arrangement with the "Atameken Agro" JSC on carrying out field tests on lentil, chick-pea, pea and other. The application on grant financing of the project on creation of the line on production of SWA is submitted.

(1) Malaysia (Dr Marina Talib, Malaysian Nuclear Agency (Nuclear Malaysia))

Production of Super water absorbent (SWA) by radiation processing was carried out and green house test on vegetable plant such as spinach, green mustard and kalian have been carried out at green house facility of Agro-Bio Science Division of Malaysian Nuclear Agency. Test was shown that utilization of 0.5% SWA sago waste increased plant weight of kalian, spinach and green mustard to 9.8, 36% and 50%, respectively compare to control without SWA. Further increase of SWA in the soil to 1.0% and 1.5% will increase the plant weight, for example green mustard to 43% and 100%, respectively compare to control without SWA. It shows that SWA sago waste has a potential to be use in retaining water or humidity level of soil for plant growth.

(4) Mongolia (Dr Amartaivan TSENDDAVAA, National University of Mongolia

With the same reason described in PGP report, research on SWA production has also not conducted. Future study will focus on wheat husk and wheat straw which can be obtained in Mongolia easily. Detailed advice need from Vietnam, Thailand and Indonesian expert.

(5) The Philippines (Ms Charito T. ARANILLA, Philippine Nuclear Research Institute (PNRI))

The proposal for funding of the SWA project still was not realized in 2015 thus there were difficulties in the implementation of the planned activities. The same proposal will be submitted to Department of Agriculture for possible funding. Despite the challenges, R&D activities were continued. The SWA based on kappa-carrageenan seaweed and acrylic acid were studied for its swelling behaviour in tap water and in simulated soil condition. Swelling capacity of SWA were observed to be lower in tap water and lowest in simulated soil solution compared to swelling capacity in deionized water. This experiment gives an idea that when SWA is applied in dry state and mixed with soil, the SWA swelling capacity will be lower, thus it will be more advisable to pre-swell the SWA before application to the soil.

Part B-2. Country Report on SWA and Future Possibilities and Needs Analysis

(1) Japan (Dr Mitsumasa TAGUCHI, Japan Atomic Energy Agency)

Carboxymethyl cellulose (CMC) hydrogel was produced by electron beam irradiation, and commercialized by NHV (Nissin High Voltage) cooperation, Japan. CMC hydrogel was used for the lamp shade, Japanese paper, base material for gold foil coating and so on.

Hydroxypropyl cellulose (HPC) is a water-soluble and biocompatible polymer. HPC hydrogel was obtained using electron beam technology in the same way as CMC hydrogel, and has high transparency. HPC hydrogel consist of 2-hydroxyethyl methacrylate, polyethylene glycol dimethacrylate, and tetrakis (hydroxymethyl) phosphonium chloride became turbid after -rays irradiation at the dose of 1 to 10 Gy. The turbidity can be confirmed by visual observation and analyzed quantitatively by using a UV-Vis spectrophotometer. Absorbance of the irradiated dosimeters increased with an increase in the dose up to 10 Gy. The dose sensitive HPC gel can be used as the dosimeter for the cancer therapy.

(2) Thailand (Dr Phiriyatorn SUWANMALA, Thailand Institute of Nuclear Technology)

The production plant of SWA with the capacity of 200 kg /day of dry SWA was set up at TINT, Prathumthanee Province. The future plan for this project is to establish cooperation with TINT's Business Development Unit in order to carry out a case study for a business potential to commercialize the super water absorbent for agricultural purposes.