Annex 5

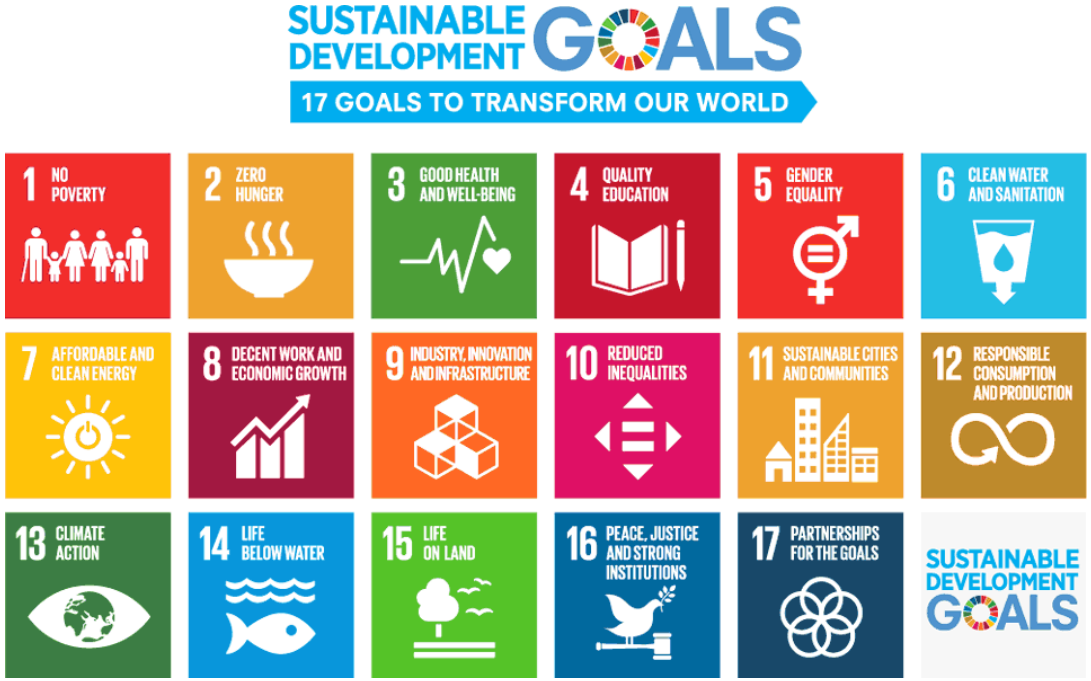
# Research Activity of RPPM project in 2018-21

| Research subjects | Bgd | Chn | Idn | Kaz | Jpn | Mys | Mng | Phl | Tha | Vnm |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Degraded Chitosan for Animal Feed | | | ✓ | | | ✓ | | | | ✓ |
| 2. Hydrogel for Medical Application | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 3. Environmental Remediation | | ✓ | | | | ✓ | ✓ | | | ✓ |
| 4. Synergistic Effect among PGP, SWA and BF | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| 5. PGP and SWA, inclusive Process development | ✓ | | ✓ | | | ✓ | | ✓ | ✓ | |
| 6. Mutation Breeding of BF Microbe using radiation | | ✓ | ✓ | | | ✓ | | | | ✓ |
| 7. Sterilization of BF Carrier using radiation | | | ✓ | | | ✓ | ✓ | | ✓ | ✓ |

# Topics in the workshop (2)
# - Planning for 2022-2024

**R&D Items**

1. Degraded chitosan for animal feeds
2. Hydrogel for medical application
3. Environmental remediation
4. Synergistic effect of PGP, SWA and BF
5. PGP and SWA inclusive process development
6. Mutation breeding of BF microbe using gamma irradiation
7. Sterilization of BF carrier using gamma irradiation



# Future plan for 2022-2024 BF

| | |
|---|---|
| Bangladesh | Combined effect of chitosan and symbiotic biofertilizer on soybean with respect to nodulation, dry matter production and yield of soybean (variety BARI Soybean-6) will be studied in laboratory scale in 2022. If promising result found, same experiment will be carried out in semi-field level experiment in 2023. Finally, we will go for field level experiment to assess the synergy-phenomena in 2024. |
| China | 1) Solid fermentation of these breeding strains of *Trichoderma guizhouenase* NJAU4742;<br>2) Commercialization of these breeding strains of *Trichoderma guizhouenase* NJAU4742 in agricultural production.<br>3) Synergistic Effect of Super Water Absorbents and Biofertilizer |
| Indonesia | Due to the reorganization of several research centers in Indonesia including BATAN to the National Research and Innovation Agency. The continuity of the research of Biofertilizer will depend on the support of the agency. |
| Kazakhstan | -- |
| Japan | -- |
| Malaysia | Current biofertilizer projects (commercialization, mutagenesis and seed treatment carrier sterilization and bioremediation) will be continue. |
| Mongolia | -- |
| the Philippines | 1. Capacity building<br>2. Improvement of Bio N technology (liquid form, multistrain product)<br>3. Conduct research on gamma irradiation of Bio N carrier for lower dosage rate<br>4. Enhancement technology transfer, marketing and commercialization<br>5. Conduct more research on biofertilizers and carrageenan application in the field |
| Thailand | Conduct product testing in farmer plots to improve, issue recommendations on the use of biofertilizers in the production of crops. Meanwhile, testing of product manufacturing and performance testing in laboratories and greenhouse. Furthermore, develop of new PGPR biofertilizer for rice with Rice Department and study of biology and ecology of soil microorganisms in rice production systems and implementation. In addition, continuing the transfer of all 3 types of PGPR biofertilizer production technology to private companies. |
| Viet Nam | 1. Wide area trials to evaluate the long-term effects of Rapol V biofertilizer on other crops (green tea, herbs, and fruit plants)<br>2. Investigate the effects of BF to some crops fertilized with lower NPK to mitigate the pollution caused by chemical fertilizers.<br>3. Set up a procedure to preparation the rice straw decomposition products from radiation induced Trichoderma mutants<br>4. Field experiments for evaluate the efficiency and applicability of the obtaining rice straw decomposition products |

# Future plan for 2022-2024 PM(1)

| | |
|---|---|
| Bangladesh | (1. Degraded chitosan for Animal Feed)<br>Conventional poultry feed has detrimental elements such as chromium which causes cancer in human bodies. In this regard we have to think about alternative so we have chosen bio-feed product like degraded chitosan. As animal we have selected chicken to explore this research.<br>(3. Environmental Remediation)<br>Arsenic is a heavy metal which is responsible to cause arsenicosis in human body. Arsenic has been found beyond the permissible limit in drinking waters of southern part of Bangladesh. Moreover, Saline water is one of major problems for the people living in the southern part of Bangladesh. To counter these existing problems we will try to explore the efficacy of hydrogel to get a better remedy. |
| China | Novel fibrous and membrane adsorbents will be synthesized for the uranium extraction from seawater. 1 kg uranium will be expected to be extracted from seawater<br>Pilot scale cotton fabric for solar-driven interfacial evaporation will be prepared with radiation technology.<br>Cooperate with companies on pilot scale up of adsorption materials prepared with irradiation induced graft polymerization. |
| Indonesia | Due to the reorganization of several research centers in Indonesia including BATAN to the National Research and Innovation Agency. The continuity of the research of application of oligochitosan on Indonesia local hen variety will depend on the support of the agency. The support funding proposal will be submitted for fiscal year of 2022, by the end of November 2021.<br>Another research activity that will be conducted is reuse plastics in which recycle plastics will develop to be use as functional product. |
| Kazakhstan | Within the framework of the project, it is planned to develop new wires and cables that are not currently produced in the Republic of Kazakhstan. It is planned to develop two types of cables, cables for photovoltaic systems and cables for oil submersible pumps.<br>The first stages of the production of photovoltaic and oil-submersible cable will be carried out on the existing equipment in Kazelectromash LLP, namely drawing, twisting, laying insulation. The next stage of production will take place in JSC "Park of Nuclear Technologies", namely, the launch of an isolated workpiece, by means of a rewinding line, under the influence of radiation. |
| Japan | We investigate the radiation crosslinking technique to develop functional devices in medical applications. In particular, we aim to develop 3D cell culture hydrogels that can be applied to drug discovery and regenerative medicine, nanosensors that can be used in MRI and PET, and microfluidic chips that can perform multiple types of simultaneous tests on a palm-sized chip and implement into society. |

# Future plan for 2022-2024 PM(2)

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|---|---|
| Malaysia | We will resume all the unfinished work which was planned before pandemic hit. The work will be focusing on completing shelf-life and performance studies of oligocarrageenan. The synergistic study also will be carried out next year which will concentrate on utilization of different PGP. As oligochitosan proved its promising activity to increase and improve yield and quality of the fish, 2022 will be suitable time to approach fish farmers for collaboration. The work on development of Carradish should be resume as planned. |
| Mongolia | -- |
| the Philippines | (1) Up-scaling of production of CMC granules and KC/PEO/PEG hydrogels in a GMP facility; (2) Validation and substantiation of 25 kGy as radiation sterilization dose; (3) Preparation for clinical trials in cooperation with the Industry partner.<br>(1) Comparison of microbial oxidative degradation between EB and gamma-irradiation SWA and (2) Performance evaluation of SWA in vertical farming. |
| Thailand | Under the project, SWA beads were successfully prepared at a laboratory scale. The future plan for the SWA beads project includes, [1] the loading and releasing efficiency of fertilizers encapsulated inside SWA beads [2] the up-scaling production of SWA beads and [3] field test of SWA beads in order to compare with previous results from the original SWA hydrogel.<br>A project proposal entitled, “Preparation of sugarcane bagasse-based SWA incorporated with chitosan for controlled release of plant growth promoter,” has been submitted by TINT for 2021 – 2024. The project will focus on the preparation of SWA from sugarcane bagasse which is an abundant biomass in Thailand. Chitosan will also be incorporated in the prepared SWA and its plant growth promoter attributes will be studied to see the synergetic effects of SWA and chitosan. |
| Viet Nam | - Study the increase of oligochitosan on productivity and content of bioactive substance of medicinal plants.<br>- Study on the synergistic effect of oligosaccharides and selenium nanoparticles on the immune-stimulation for use in breeding and functional food.<br>- The production of oligochitosan as an additive to increase the immune system in aquaculture at a pilot scale.<br>- Commercialization of oligochitosan in livestock and aquaculture. |

# Research Activity Plan in 2022-24

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|---|---|---|---|---|---|---|---|---|---|---|
| 1. Degraded Chitosan for Animal Feed | | | ✓ | | | ✓ | | | | ✓ |
| 2. Hydrogel for Medical Application | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | ✓ |
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| 4. Synergistic Effect among PGP, SWA and BF | ✓ | | | ✓ | | ✓ | ✓ | ✓ | | |
| 5. PGP and SWA, inclusive Process development | ✓ | | | | | ✓ | | ✓ | ✓ | |
| 6. Mutation Breeding of Microbe using radiation | ✓ | ✓ | ✓ | | | ✓ | | | | ✓ |
| 7. Sterilization and sanitization using radiation | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ |
| 8. Recycle plastic | | | ✓ | | | | | ✓ | | ✓ |