2017/7/31

IAEA 與 NEA 動態報告

2017/7/17- 7/28

JAPAN DISCUSS NEXT STEPS ON RECOVERY EFFORTS AROUND FUKUSHIMA AFTER MAJOR MILESTONE ACHIEVED

日本在達成福島復原的重要里程碑後，討論新階段的工作

At a recent meeting with the IAEA, Japan's Ministry of the Environment (MOE) presented the progress made with the remediation efforts taking place in off-site areas affected by the TEPCO Fukushima Daiichi NPP accident.

The IAEA team saw that continuous progress was being made with the remediation activities in Japan and that a milestone for completing decontamination has been reached as planned.

報告摘要(KEY INFORMATION)

1. 日本的環境部門在與國際原子能總署的會議上介紹了福島第一核電站事故影響地區的補救工作情況，專家學者認為日本的補救計畫已經達成去污的重要里程碑，並將進入新的階段迎接新的挑戰。
2. 巴拿馬農業研究所（IDIAP）舉辦了關於在農業研究中使用氮-15 的研討會。該會致力於提高巴拿馬的水稻作物產量，並著重同位素氮-15 在土地研究中的主要應用。
3. 輻射通常應用於詳細分析和保存精美的繪畫，但必須確保所使用的技術不會損壞被分析的材料，在荷蘭舉行的國際原子能技術會議，製定分析和保存繪畫的最佳做法。
4. 多明尼加共和國(Dominican Republic)在國際原子能總署的支持下，利用核技術剷除了一種主要的農業害蟲-地中海果蠅。
5. 柬埔寨農業研究人員協同國際原子能總署和聯合國糧食及農業組織，利用核技術來測量水稻和其他作物的肥料和水分來實現高產量。
6. 核能署計畫指導部門在瑞典召開了一次會議，共有 70 多名與會者來自 30 個合作夥伴機構代表參加。參與者討論了最近的實驗結果和該項目的未來安全操作計劃。
7. 核能署法規委員會於 2017 年 6 月 21 日至 22 日舉行會議，該會議匯集了來自成員國和國際組織的 70 位專家代表，會議與會者就該國家最新的國家核法律發展情況交換了資訊。

The IAEA team also recognized that some major challenges still needed to be overcome relating to the future management of wastes and soils arising from the decontamination works. The pursuit of recycling options, with the consideration of proper safety assessments, was encouraged. A summary report of the expert meeting, held from 17 to 21 April 2017 in Tokyo and in Fukushima prefecture, is available here.

The IAEA and MOE have been holding, since 2016, expert meetings on off-site remediation efforts. This third meeting was comprised of sessions that focused on outcomes of the environmental remediation works carried out so far; lessons learned on remediation based on data collected in Date City; mechanism established to evaluate the effects of full scale decontamination; and how to best share with the international community the results from the applied technologies for decontamination and waste volume reduction. The IAEA team also carried out site visits to review the activities on soil-recycling conducted in Minami-Soma City and the incineration of combustible waste in a dedicated facility in Date City.

The IAEA team also highlighted the need for extensive stakeholder engagement to assist the society in understanding the rationale behind each option, and to clarify, in a transparent manner, all the potential complex points so that a consensus can be reached on optimized/sustainable management options. The IAEA offered its continued support to Japan in this effort by exchanging information on international good practices.

The efforts of Japan in sharing information with the international community on aspects related to the remediation works were acknowledged particularly with the preparation of the 2nd decontamination report by the Ministry of the Environment, expected to be issued towards March 2018.

USING NITROGEN-15 IN AGRICULTURAL RESEARCH: IMPROVING CROP PRODUCTIVITY IN PANAMA

在農業研究中使用 NITROGEN-15：提高巴拿馬的農作物生產力

A seminar focusing on the use of Nitrogen-15 (15N) in agricultural research has taken place at the Agricultural Research Institute of Panama (IDIAP) from 12 to 16 June 2017. The course, led by Dr Plinio Barbosa de Camargo of the University of Sao Paulo's Centre for Nuclear Studies in Agriculture (CENA), Brazil, brought

together eight postgraduate students working on soil and water management at the University of Panama, together with the national counterpart Dr Jose Villarreal. The seminar was supported by an IAEA technical cooperation project[1] dedicated to enhancing rice crop yields in Panama, and was focused on explaining the main applications of isotope 15N in agrarian research. Rice is a staple food crop in Panama, and the national government is seeking to achieve food security for the population.

Nitrogen-15, a stable isotope of nitrogen and an essential plant nutrient, is used to determine the fertilizer use efficiency of crops. It is also used to quantify the amount of nitrogen that crops can acquire from the atmosphere through a process known as biological nitrogen fixation. This helps to reduce the application of purchased nitrogen for crop and livestock production, and can result in very significant cost-savings in agriculture. Nitrogen-15 is also used to assess integrated soil-water management practices to optimize crop productivity. It can be applied to various vital crops including rice and sugar cane.

The seminar participants also had an opportunity to visit the sugar cane plantations of the sugar mill La Estrella, one of the most important in Panama. Here, they learned about plot design, forms of 15N application, and sampling of leaves and soil for the development of experiments using this important isotope.

NUCLEAR SCIENCE FOR ART: WORKSHOP FOCUSES ON SAFE PRACTICES

核子科學應用於歷史藝術品的修復與保存

Radiation is commonly used for detailed analysis as well as preservation of delicate paintings, but it is imperative to ensure that the techniques used do not damage the material being analysed. This was the focus of 40 experts across multiple disciplines who attended an IAEA technical meeting in the Netherlands last week to develop and identify the best practices for examining and treating paintings with ionizing radiations.

“Historical paintings play a large role in the cultural heritage of most regions of the world and so taking all the steps possible to make sure that they are being adequately analysed and preserved are of the utmost importance,” said

Aliz Simon from the Division of Physical and Chemical Sciences at the IAEA and meeting co-chair.

At the meeting, entitled “Developing Strategies for Safe Analysis of Paintings and Paint Materials”, curators, conservation scientists, radiation specialists, physicists, chemists, material and accelerator scientists worked in unison to better understand the effects of ionizing radiation on paintings and paint materials and to identify the least invasive protocols to perform analysis.

The techniques included the use of intense photon, electron, ion and neutron beams produced by particle accelerators and research reactors for analysis of paintings from the past, such as to scan whole paintings or image small parts of paint samples to learn more about their composition, manufacturing methods and history.

“ Recent developments in high-resolution imaging bring innovative strategies to the study of paintings, particularly on the nanoscale. However, we need to better understand the effects of the corresponding nuclear interactions with the material studied, for the collected results to give their full meaning,” said Loïc Bertrand, Director of the ancient material research platform IPANEMA at the SOLEIL Synchrotron in France.

The meeting participants developed a risk assessment strategy document called “Irradiation History Wizard”, which includes several aspects of the analysis, such as its benefits and risks, and alternate routes to minimize material alteration while still optimizing the analytical data produced. “This document will create a new way of thinking and will help both the analysts who are conducting the irradiations and curators who are the owners of the heritage materials or objects to better understand and predict the possible effects of irradiations,” said Ineke Joosten, the local host, technical meeting co-chair, Cultural Heritage Agency of the Netherlands (RCE). “The meeting participants are coming from or collaborating with around 70 museums, so the risk assessment strategy developed during this meeting will certainly help our common understanding and will reach the users of nuclear analytical techniques in an efficient and direct way.”

The results of this meeting, in collaboration with the Cultural Heritage Agency of the Netherlands, the Rijksmuseum Amsterdam and IPANEMA, will not only spread awareness but also provide Member States with some practical and tangible recommendations, and suggest development of new tools for the safe analysis of materials in ancient paintings.

The IAEA’s role in promoting the applications of nuclear techniques in the field of cultural heritage artefacts is unique as it covers both the analysis (exploration and forensics) and preservation. In order to ensure the safety of heritage materials when radiation based tools are used for analytical purposes, the IAEA has initiated activities focusing on ‘safe analyses’, addressing several categories of art, archaeological and paleontological materials. Such activities enhance the collaboration and

exploit synergies between the extended community working on the effects of irradiation and the heritage science community.

NUCLEAR TECHNIQUE HELPS DOMINICAN REPUBLIC ERADICATE INSECT PEST THAT HURT AGRICULTURAL SECTOR

核技術幫助多明尼加共和國消除害蟲對農業的傷害

The Dominican Republic has eradicated a major agricultural pest, the Mediterranean fruit fly, by using a nuclear technique with the support of the International Atomic Energy Agency (IAEA). The Caribbean country today officially declared in a ceremony in the capital Santo Domingo that it is free of the insect, two years after an outbreak led to considerable damage to its agricultural industry.

The IAEA, in partnership with the Food and Agriculture Organization of the United Nations (FAO), provided assistance to the Dominican Republic to suppress the agricultural pest using the Sterile Insect Technique (SIT). This form of insect birth control uses radiation to sterilize a large number of male insects, which are then released to mate with wild females. Since these do not produce any offspring, the insect population is suppressed, or eliminated, over time.

The effort to help the Dominican Republic was carried out together with the United States Department of Agriculture (USDA), the International Regional Organisation for Plant and Animal Health (OIRSA), the Inter-American Institute for Cooperation on Agriculture and the joint Guatemala-Mexico-USA Moscamed Programme.

The outbreak of the Mediterranean fruit fly in the Dominican Republic was first reported in March 2015 near the popular tourist city of Punta Cana, and rapidly spread to a 2,000 square kilometres-area in the east of the country. Although 200 kilometres away from producing areas, an immediate import ban was placed on several agricultural products, including avocado, citrus fruits, papaya and peppers, by major trading partners, such as the United States, Haiti and Japan. The ban resulted in an estimated loss of US $42 million in fruit and vegetable exports in 2015 alone, putting thousands of jobs at risk. As a result of the eradication efforts, it has since been gradually lifted.

"Today's declaration that the fruit fly has been eradicated represents a remarkable achievement for the Dominican Republic, the IAEA and its partners," said IAEA Director General Yukiya Amano. "The Agency is pleased to have been able to help the country to regain access to key export markets."

"The Mediterranean fruit fly is one of the most damaging agricultural pests in the world," said IAEA Deputy Director General and Head of Nuclear Sciences and Applications Aldo Malavasi, attending the ceremony in Santo Domingo. "The insect attacks several varieties of fruit and vegetable, and spreads very fast." A female fly can lay more than 300 eggs, and in as little as six months, a population can establish itself in a country the size of the Dominican Republic.

The IAEA provided assistance – through its Technical Cooperation programme – to adapt a facility in the town of Higuey to host sterile male flies brought in from El Pino, Guatemala. From October 2015, over 4 billion sterile flies were released in the affected areas. The Agency, together with the FAO and USDA, also trained local personnel in setting up surveillance systems throughout the country to trap and identify the fly, and in complementary pest control methods, such as tree pruning, the destruction of potential host fruits and the selective use of pesticides.

"We are very grateful for the IAEA assistance," Agriculture Minister Angel Estevez said. "Through this transfer of knowledge, the Dominican Republic is now well prepared to tackle any possible future outbreaks, and can quickly respond to eradicate it."

The SIT is an environmentally-friendly and effective method to suppress or eradicate selected insect populations, and is particularly effective in areas that are difficult to reach with other pest-control methods, such as mass-trapping and the application of insecticide. The method is used on a routine basis in countries like the United States to keep harmful insects at bay, such as the Mediterranean fruit fly and the screwworm fly.

CAMBODIAN RESEARCHERS USE ISOTOPIC TECHNIQUE TO HELP FARMERS INCREASE YIELDS AND REVENUES

柬埔寨研究人員使用同位素技術幫助農民增加產量和收入

Phnom Penh, Cambodia – Poorer farmers who cannot afford to buy enough fertilizer can achieve high yields by using more manure and compost and planting alternative crops between rice growing seasons, Cambodia's agricultural researchers have found. Their recommendations are the result of research supported by the IAEA and the Food and Agriculture Organization of the United Nations (FAO), using nuclear-related techniques to measure fertilizer and water uptake by rice and other crops.

Cambodia is among a growing number of countries using such techniques to increase crop yields, optimize fertilizer use and evaluate varieties of rice, cereals and vegetables for their efficiency in making the best use of fertilizers. (See Labelled nitrogen isotope for more) Currently, scientists from over 60 countries are benefiting from assistance in this area.

Blending organic and inorganic

Experiments conducted by scientists at the Cambodia Agricultural Research and Development Institute (CARDI) found that replacing half of the recommended amount of chemical fertilizer with organic materials when inorganic fertilizer is either not accessible or too expensive increases rice yields. This has various benefits, explained Sarith Hin, Head of Soil and Water Science at CARDI: farmers save money on chemical fertilizer, and at the same time they can achieve higher yields.

"The results demonstrate that even poorer farmers, who cannot afford to buy much fertilizer, can increase yields," Hin said. In the case of peanuts, a legume cash crop, replacing half of the chemical fertilizers with a mix of cattle manure and rice straw more than doubled yields (see graph). For rice, the use of a reduced amount of chemical fertilizer with organic manure led to yields comparable to the use of chemical fertilizers only.

Agriculture accounts for 27% of Cambodia's economy, and provides the livelihood of 60% of the population. Many of the country's poor are subsistence farmers working on small plots of land, so increasing the productivity of their land is key to achieving higher income and escaping poverty. Historically, fertilizer use in Cambodia is neglected by farmers.

Borey Thai, a farmer with 1.5 hectares of land in Kampong Speu province south of Phnom Penh, replaced half of the chemical fertilizer with a mix of manure and farmyard waste in this year's growing season – and has saved a third of the money she used to spend on fertilizer. "It is much cheaper, but is more work," she said. "But what matters is that I can use the savings to renovate my house." She expects her yield to be around 20% higher this year compared to the previous year, thanks to the use of mixed fertilizer.

One challenge her neighbours face, she added, is to find good quality manure. “If we could find more manure, more of us would switch to organic.”

Alternative crops

Using the fields for the production of other crops in between rice growing seasons is another way for farmers to increase their income, found researchers of the country’s Ministry of Agriculture. Historically, farmers have used their fields only during the rainy season, when there is enough rain water to grow rice. During the dry season, lands are left idle.

Researchers have found that conditions during the dry season are optimal for other crops, particularly legumes such as beans and lentils. “These would not only provide farmers with additional income, but legumes add nitrogen from the atmosphere to the soil and, in addition, decomposing bean plants also increase the quality of the soil, leading to higher rice yields in the following rice season,” said Phirum. They used the nitrogen-15 isotopic technique to study the amount of fertilizer absorbed by the plants from the soil, fixed from the atmosphere, in addition to quantifying the efficiency of fertilizer applied.

The research teams received various forms of support under the IAEA’s technical cooperation programme. They learned the use of nuclear-related and other techniques in workshops and through participation in fellowships in neighbouring countries. They received equipment and materials to conduct the experiments, and advice from experts at the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in interpreting the results.

JOINT PROJECTS ON NUCLEAR SAFETY RESEARCH

核能署核能安全研究共同計畫

On 30 May-1 June 2017, the NEA Studsvik Cladding Integrity Project (SCIP-3) steering bodies held a meeting at the Swedish Studsvik establishment with more than 70 participants representing 30 partner organisations from member countries participating in SCIP‑3. Participants discussed the recent experimental results and the project's future programme of work. Phase I of the SCIP project was completed in June 2009 and its second phase ended in June 2014. SCIP‑3, which started in July 2014, aims to study fuel behaviour loss‑of‑coolant accident (LOCA) and off‑normal temperature transients from a safety and operational point of view. Through SCIP‑3, representatives from regulatory bodies, utilities, vendors and research organisations aim to establish a common understanding, enabling a shared view on safety matters, operational concerns and mechanisms of different phenomena.

LATEST DEVELOPMENTS IN NUCLEAR LAW

核能法律的最新發展

The NEA Nuclear Law Committee (NLC) met on 21-22 June 2017, bringing together 70 experts from member countries and international organisations, as well as several representatives from non-member countries, including China, Lithuania and Romania. Participants at the meeting exchanged information on the latest national developments in nuclear law and discussed current activities conducted under NLC auspices on nuclear liability, legal aspects of nuclear safety and public participation. The meeting also featured a topical session with representatives from the Government of Japan who provided updates on the compensation by TEPCO of the victims of the Fukushima Daiichi nuclear power plant accident.