Promotion, partnership and transfer of nuclear technology to end users in the food and agriculture sectors in Indonesia

This Best Practice was submitted by Mr Anhar Riza Antariksawan, Mr Totti Tjiptosumirat and Mr Ruslan Ruslan as part of the Best Practices Cycle 2016

Description

The Utilization of Nuclear Science and Technology Research and Development (Pendayagunaan Hasil Litbang Iptek Nuklir - PHLIN) programme was established by Indonesia's National Nuclear Energy Agency (BATAN) to increase the application of nuclear science and technology (NS&T) research and development (R&D) results in the field of food and agriculture. Programme activities are conducted through tripartite cooperation between BATAN, universities/colleges/community groups/related agencies as agents of technological transformation, and the region's local government authorities and regulators.

Categories:

7. Project Results

Subcategories:

a) Sustainability of a transferred technology,
b) Adoption and utilization of technology by end-users

PHLIN activities are led by the Centre for Dissemination and Partnership (PDK) of BATAN, which is responsible for the dissemination of NS&T R&D results, especially in the field of food and agriculture, to communities and end users throughout Indonesia. Food and agriculture products and technology promoted and utilized by PHLIN are all proven, and have the potential for development in accordance with the characteristics of partner regions. Most products disseminated by the PHLIN programme are connected with an IAEA technical cooperation project, such as INS5038 'Using Induced Mutations to Improve Rice Productivity through a Hybrid Rice Breeding Programme', INS5035 'Application of Nuclear Techniques for Screening and Improving Cash Crop Plants in Coastal Saline Lands', and INS5039 'Enhancing Food Crop Production Using Induced Mutation, Improved Soil and Water Management and Climate Change', as well as other projects in the field of animal husbandry and livestock. Moreover, Indonesia has been recently appointed by the IAEA as Collaborating Centre on Plant Mutation Breeding for Climate Smart Agriculture 2017–2021.

Most PHLIN activities are in agriculture, as they relate to food security and self-sufficiency: demonstration plots and farms, breeding and proliferation of improved seed crops such as rice and soybean using nuclear technology, and food preservation using irradiation. In some regions, activities relate to animal husbandry, fattening and reproduction management of ruminants, tracking of groundwater and land bioremediation.

Through PHLIN, superior food crop varieties, produced from mutation breeding, have been introduced in different regions. For example, 23 rice varieties have been planted in over three million hectares of agricultural land, as well as ten varieties of soybean and three sorghum varieties.

To ensure the sustainability of the programme, the forum BATAN Agro Partners Club (BAPC) was established to bring together the community of seed breeders using BATAN varieties.

Problem/issue

The 1998 economic crisis in Indonesia brought community food security to the fore, prompting the government to strengthen food and agriculture programmes. When the crisis ended, new challenges emerged, such as population growth, climate change and regional development, which diverted agricultural land to housing and industrial use. Most of Indonesia's population depends on agricultural products, so increasing productivity of crops is a challenge. Better agricultural productivity will improve the living standards of farmers and the welfare of society in general. Improving the productivity of animal husbandry will also improve community welfare. Better livestock productivity would increase the yield of meat in the country and allow for competition with imported meat. Availability of water for agriculture and consumption also requires attention – it is necessary to identify suitable sources of groundwater.

Without inter-institutional cooperation and communication, most R&D results will not reach end users. A systematic, strategic approach is necessary if technology is to be promoted and transferred to end users. For example, the selection of a new rice variety will have to consider different positive and negative characteristics – less popular varieties but with higher productivity, improved taste but longer cropping periods, or resistant to pests but a poor physical plant. From a wide range of varieties, some have certain advantages so that farmers can achieve maximum results.

How & who

BATAN addresses these issues both upstream and downstream. Upstream work includes conducting R&D on mutation breeding techniques to obtain improved varieties of food crops with high productivity levels, resistance to pests, that are visually appealing, taste good and have shorter harvest times. Concerning animal husbandry, NS&T is used to study ruminant feed supplements that can increase the appetite of the animals. Isotope hydrology techniques are also developed to address problems associated with drought and water shortage.

This Best Practice concerns the downstream work: delivering the above R&D results to the end user through the PHLIN programme, which is implemented by multiple stakeholders including local universities and/or local government and local community or farmer groups.

Approach

The PHLIN programme is composed of four stages, which also reflect the level of financial support from BATAN: introduction, empowerment, self-reliance, and commercialization/ partnership.

The introduction stage aims to increase public knowledge of NS&T and associated R&D results in fields such as agriculture and animal husbandry. This stage includes face-to-face meetings with local stakeholders and dissemination through electronic media (local radio and/or television), the conduct of discussions aimed at understanding and finding the best technology for the needs of each region, and the creation of a demonstration plot for the introduction of superior crop varieties in order to check the adaptability in the region.

At the empowerment stage, BATAN transfers the technology needed to the end users. 'Demonstration farms', where agricultural varieties adaptable to the region are planted, show farmers the benefits. At the self-reliance stage, farmers and end users have the capacity to adopt the technology and to develop their own activities. At this stage, need for the new product is clear, and local breeders are building the capacity to breed the new superior varieties to fulfil the need of potential market in that region. In the commercialization stage, commercial activity is started. Partnerships between BATAN and nuclear technology adopters are established to develop business plans and for ensure assistance to maintain the quality of the product.

Monitoring and evaluation techniques have also been implemented in this programme. The programme's work plan is discussed at the beginning of each year, and biannual reports are submitted to partners. At the end of the year, a workshop aimed at evaluating the implementation of the programme and building a solid stakeholder network is held. A web-based management application, SiMitra, has also been developed. It examines monitoring, evaluation and workshop activities to establish whether a region still needs continuous support – particularly financial support – or whether there should be any programmatic changes.

How effective

PHLIN has been successfully introducing, disseminating and transferring the results of BATAN's R&D in the field of food and agriculture to end users for 16 years. The programme has been extended to 24 provinces in Indonesia, bringing many economic benefits.

The success of the programme activities can be measured by comparing productivity using new crop varieties with the respective average for the region. Regions using the new superior varieties show an increase in productivity, and through PHLIN, the area of agriculture land cultivated using new superior varieties is increasing.

PHLIN also plays a role in informing and instructing the public about NS&T in general. The programme also allows BATAN to strengthen networks with regional institutions across the country, although its geographical scope is still relatively small.

Lessons learned

PHLIN has demonstrated that nuclear technology applications can be used directly by farmers and therefore contribute to regional development. Each region has different potential and characteristics which requires an approach tailored to the needs of the end users or beneficiaries. It is believed that the programme's R&D could be designed to fulfil specific needs - for example, some regions asked BATAN to improve their local varieties in order to get better characteristics.

PHLIN has also confirmed that the synergy between institutions is essential. BATAN R&D results cannot be disseminated to the end users and public if there is a lack of communication and cooperation between stakeholders. PHLIN has also changed the general public's perception about NS&T, once seen as dangerous and only useful for energy production. PHLIN also established that sharing success stories allows for the development of nearby regions.

Key success factors

Several key success factors of the PHLIN programme are:

- Mapping the potential capacity of a region and deciding the appropriate programme to be implemented in the targeted areas;
- Selecting the appropriate regional partners, whether working with local governments, universities or other public institutions, that play a role in empowering society in the region;
- Promoting solid communication between BATAN and the partners as a crucial implementation factor in finding common solutions;
- Mentoring/supervising, monitoring and evaluating programme and workshop activities in order to exchange information between local partners.

Beneficiaries

Farmers benefit directly from the programme through the increase in agricultural products and animal husbandry. This improves public welfare that, in turn, benefits local governments by increasing the available income of the population and providing for food self-sufficiency. The dissemination of BATAN's R&D results also benefits the organization by increasing public acceptance concerning NS&T.

Quality criteria

Relevance, sustainability and effectiveness. PHLIN is relevant because it uses NS&T to support the national development programme by promoting food self-sufficiency and improving farmer welfare. The efficiency of PHLIN is evaluated through the plan–do–check–act (PDCA) management system, translated into the application of R&D results by the end users. PHLIN's sustainability is assured by the commercialization of the products.

Special conditions

There are no special conditions that can prevent others from adopting the PHLIN programme.