COSTA RICA
Costa Rica’s agricultural waste converted into charcoal to filter and dispose of polluting agricultural chemicals

Burning agricultural waste in a controlled environment to make charcoal and then using that charcoal to filter leftover agrochemicals before disposing of them is just one of the steps taken to clean up chemical contamination that pollutes the soil and water of central Costa Rica. In addition to promoting use of these “bio-beds”, Costa Rican farmers are being trained in Good Agricultural Practices (GAP) – practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products. For example, GAP stresses the proper handling and use of agrochemicals but also the environmentally friendly disposal of any chemicals the farmer has left over. All this is part of a Joint FAO/IAEA Division project to support food and environmental safety in Costa Rica by providing specialized testing equipment and training laboratory personnel so they can oversee a campaign to clean up the environment and establish an ongoing monitoring programme to ensure it is kept clean.

Keeping the agricultural landscape clean and safe is not only important for the local environment and public health, it also impacts a country’s compliance with food safety standards and its ability to export its produce to other countries. Almost 85 percent of Costa Rica’s vegetables – for both local consumption and export – come from the Cartago region in the country’s central valley. However, toxic residues from the indiscriminate use of agrochemicals and fertilizers have contaminated Cartago’s water, soil and the environment, raising public health concerns, and adversely impacting wildlife and fish in the area. Costa Rica’s water resources are especially prone to agrochemical contamination because of high rainfall that can reach 16 000 mm per year. Problems arise because the rain washes unabsorbed pesticides off the plants, contaminating both soil and water.

Partnering with the Costa Rica Environmental Pollution Research Center (CICA), the Joint Division initiated a two-level solution: training farmers in GAP with a focus on raising community and government awareness of the detrimental effects of improper agrochemical use, and providing state-of-the-art lab equipment to monitor residues and contaminants in food, soil and water. Farmers apply what they learn in GAP training to protect their water supply and environment as well as the health of their families and neighbours. At the same time, laboratory personnel receive scientific support and training on the use of equipment provided through the Joint Division, improving their ability to pinpoint existing contamination and to test for presence of herbicides, insecticides and fungicides throughout the Cartago region.

The equipment provided to CICA included a high-tech liquid chromatograph coupled with a mass spectrometer (LC-MS-MS) that, together with nuclear and isotopic techniques, enable the testing and characterization of even the smallest amounts (parts per billion) of pollutants. As part of their training in analytical and monitoring techniques for food safety, lab personnel have learned to take random samples from the field or processing plants, and scientists have developed methods for extracting the samples, meaning extracting toxic agricultural chemicals from the foodstuff for testing. They can now use the state-of-the-
art LC-MS-MS to analyse the extract and ensure that the foodstuff complies with international safety standards and is safe for the population to eat.

The Joint Division also helped buy and install a gamma irradiation unit at the Technological Institute of Costa Rica and trained scientists in its use. The gamma irradiation unit has a wide range of uses, including irradiating foods to eliminate harmful microbial (bacterial) contaminants, developing higher yielding, disease-resistant or drought-tolerant plants and thereby improving food production, and developing applications for health care and human ailments.

Project links laboratory with the field

The project, which began in 2012, provided critical links between the field and labs. When an initial survey carried out by CICA’s lab confirmed the presence of dangerous contaminants in water resources and the environment, its conclusions became the fodder for a successful awareness-raising campaign. It proved to farmers that the environmental and public health situation had reached such a point that their use of GAP was critical for cleaning up the environment and keeping it clean. Once educated on the environmental and public health situation created by indiscriminate and uncontrolled agrochemical use, the farmers were convinced of the health, environmental and economic benefits of adopting good agricultural practices.

CICA’s follow-up assessments have shown that large numbers of farmers in the Cartago area are now following GAP in their use of agrochemicals. They are also using their on-farm bio-bed purification systems – which were developed with technical support from the Joint Division – to minimize contamination from their leftover chemicals. Initial data of contamination before and after GAP adoption shows that residues of the insecticide chlorpyrifos dropped 80-fold in river sediment and the residues of the insecticide cypermethrin dropped two-fold. As the farmers could see for themselves, not only has adoption of GAP helped provide cleaner drinking water and a better environment, it has provided an inexpensive way for them to optimize their safe use of and, in turn, reduce their need for expensive agrochemicals.