



Photo Credit: Terry Clayton

Improving soils and boosting yields in Thailand

Healthy soil

IWMI researchers, in cooperation with Khon Kaen University and local farmers, succeeded in boosting crop yields with a simple soil improvement technique.

A key property of soil is its ability to provide nutrients and water to growing crops. Clays and organic matter are vital in this regard. However, it is often difficult to retain organic matter in tropical soils, so farmers need to routinely apply compost. Soils that contain high levels of particular clays such as smectites, are often very fertile. For example, smectite-rich clays on the Central Plains of Thailand are among the most productive in the world. As productivity declined in the farmlands of Northeast Thailand, which have soils with low clay contents, farmers sought to add material from clay-rich termite mounds to their soils. However, because of overexploitation this natural resource soon became scarce.



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Boosting soil productivity

Scientists conducting studies in Australia found that adding bentonite, one of the smectite family of clays, could help increase soil productivity by assisting in the retention of water and nutrients. Motivated by this work, IWMI researchers, in cooperation with Khon Kaen University and local farmers, conducted various trials in Northeast Thailand. The aim of one project was to assess the impacts of applying locally sourced bentonite to rice yields. Supplementing the farmer's usual practice with a single application of 200 kg of bentonite per rai (6.26 rai = 1 ha) resulted in an average yield increase of 73%. This was despite the bentonite being of relatively poor quality. Further studies showed that applying locally sourced bentonite to degraded sandy soils also reduced the risk of crop failure during drought years.

Taking the results of several such field trials on yields of forage sorghum, scientists recorded a sixfold increase in biomass production after applying bentonite and mixing it with the soil using a rotavator or disc plough. The researchers also demonstrated that the increased soil quality generated by a single application of clay persisted for at least 3 years. By tapping into existing farmer networks, they encouraged wider uptake of bentonite clay as a means of improving the soil condition.

In 2008, 3 years after the initial trials, IWMI scientists conducted a survey among 250 farmers in Northeast Thailand, half of whom had conditioned their fields with clay and half who had not. The average output for the farmers using bentonite was 18% higher than for non-clay users. Using the clay had enabled some farmers to switch to growing vegetables, which require more fertile soil. Because the value of vegetable crops is much higher than staples such as cassava, these farmers earned more on-farm income as a result. The researchers estimated that some 200 farmers in Northeast Thailand and 400 in neighboring Cambodia had adopted the use of clays, and that a further 20,000 farmers were introduced to the new technique.

A new industry

Thailand's Land Development Department (LDD) has subsequently developed a product, called LDD10, combining waste bentonite from the vegetable oil industry with organic material. This is cheaper than applying pure clay but equally effective. The LDD is producing around 1,000 tonnes of this material annually. Farmers can obtain it for free but have to cover the costs of transporting it to their land. IWMI's work has also generated interest elsewhere. Bentonite has traditionally been used as an industrial mineral. Now, producers in South Africa are conducting trials with the aim of developing a product to be marketed as a soil improver. Meanwhile, a large bentonite producer in Australia has been conducting trials on the island of Nauru to see if clay can effectively rehabilitate soils following mining for phosphorus.

Donors and collaborators

IWMI worked with Khon Kaen University, the Land Development Department of the Royal Thai Government and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) during its bentonite soil-improvement project in Northeast Thailand. The Australian Centre for International Agricultural Research (ACIAR) provided funding support to partners.

For more information

IWMI report:

www.iwmi.org/Research_Impacts/Impact_Assessment/Outcome_Stories/2008/Bentonite%20clays-%20edited%20outcome%20story_final%20_Web_.pdf