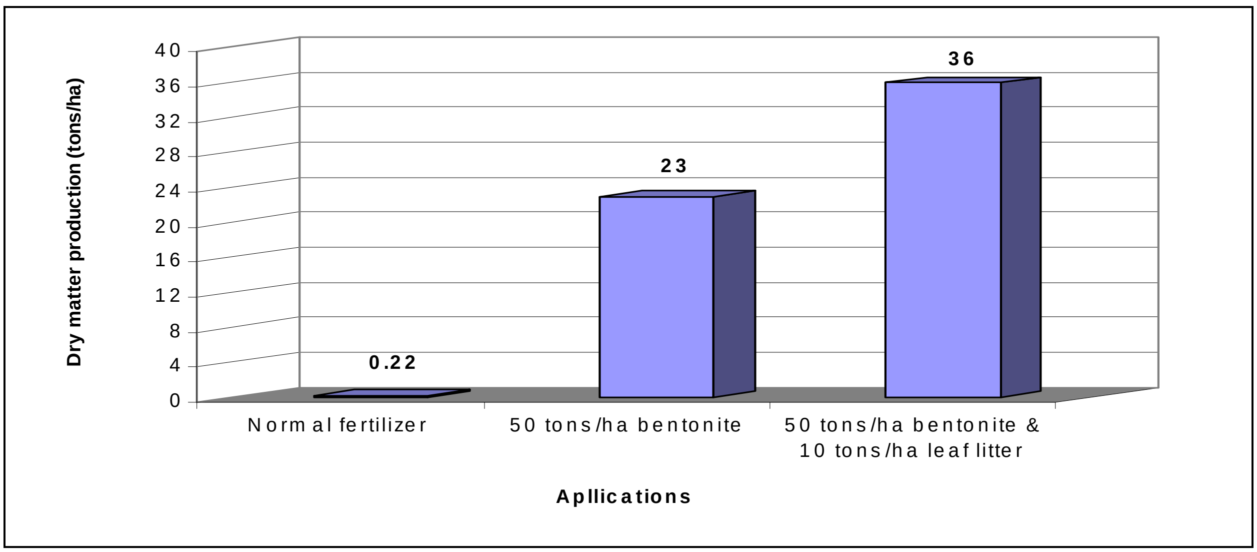
Eco-friendly clay technology rejuvenates degraded soils and improves yields and incomes in NE Thailand

Over the past 40 years, Northeast Thailand underwent significant changes in land use. Farming systems moved from being subsistence–based to commercial-based, typically characterized by paddy rice production in the lowlands and sugarcane/cassava production in the uplands. However, the intensification of these production systems resulted in negative impacts on soil chemical properties that are best described as a nutrient/resource mining operation. As a consequence of these changes, productivity and production systems declined, as soils became depleted of their nutrients and water-retaining properties.

IWMI research is helping to reverse this trend in Asia through clay-based technologies that rejuvenate degraded soils. The research, carried out by IWMI and partners in structured field trials, focused on the use of bentonite clay by farmers in Northeast Thailand, which has dramatically reversed soil degradation and resulted in positive economic impacts, with higher yields and output prices. Several studies by the research team during the research phase conclusively demonstrated that introducing clay-based materials such as bentonite and termite mound materials have a significant and persistent impact on the productivity of degraded, light–textured soils (Figure 1).

Figure 1: Cumulative dry matter production over two years



Following the field trials, estimates showed that some 200 and 400 farmers in Thailand and Cambodia adopted the technology and a further 20,000 farmers were exposed to it in those countries. In addition, it generated interest among bentonite producers in South Africa and Australia. In 2008, to quantify the impacts of this intervention, IWMI and partners completed an ex-post impact assessment three years after the research ended (Saleth et al. 2009 forthcoming). A structured survey was undertaken with 250 farmers, equally split between farmers who had adopted clay-based approaches versus those who had not. Four different economic impact assessment methods were used. The analysis was done at both the sample as well as extrapolated to the regional level.

Although the impact was essentially agronomic, the interventions also tended to induce some major changes in the economic dimensions of farm production, especially in terms of changing the level and composition of different farm inputs and improving the market responsiveness of production systems. It is the variations in the quantity and composition of these yield-increasing inputs that explain the differing productivity levels and the cost-return on investment of farms which used clay applications and those that did not.

From an agronomic perspective the average output price for farmers using clay technologies was 18% higher than that for non-clay users. This suggests that either clay-using farmers go for high value crops (as in vegetable farms) or they receive a higher price for their produce, due to better output quality (e.g. from organic rice and integrated farms). Production costs are higher but due to the higher level of production and the quality of the yield, clay farmers could afford the investment and achieve higher net returns compared to non clay-using farmers. For example, the average per hectare cost of clay using farms was 57% higher than that for non-users, but the per hectare gross revenue of farms using clay technologies was twice that of non-clay using farms. Since the net values of the treated and control groups were compared, clay application led to a net benefit of about 120%.

Recognizing the roles of partners and others, the ex-post evaluation estimated the benefit shares attributed to IWMI as 50 and 10 percent respectively for the sample and regional evaluations. From an exclusive IWMI perspective, the Project has a net present value of (NPV) of US$ 0.41 million involving an internal rate of return (IRR) of 36%t and a benefit-cost ratio (BCR) of 2.44 in the sample context. But, in the larger context of the region, it has a NPV of US$ 21 million involving an IRR of 267% and a BCR of 75. Since impacts cover only direct income benefits and their evaluation involves conservative assumptions on benefit calculation and attribution, these estimates represent only the lower bounds for the true size of project impact. In addition, despite an apparent soil focus, the evaluated impacts equally capture the yield effects of improved water-holding capacities of rejuvenated soils.

References

Saleth, R. M., Inocencio, A, Noble, A and Ruaysoongnern, S. 2009. Economic Gains in Improving Soil Fertility and Water Holding Capacity with Clay Application: The Impact of Soil Remediation Research in North-East Thailand. Forthcoming.