UNCOVERING PRODUCTIVITY

Amid the many heartbreaking stories from the December 2004 tsunami is one that is still unfolding – the loss of agricultural productivity in many areas of Aceh and Northern Sumatra, report **Robin Taylor** and **Warren Page**

Although life is far from returning to normal, agriculture, the main income source for many people in Aceh and Northern Sumatra, continues even as rebuilding goes on. Given the scale and breadth of the devastation the clean-up efforts have been extensive and time-intensive. Most of this has, understandably, been focused on urban areas, villages and infrastructure. But for some farmers starting to think about replanting crops, a substantial barrier exists. Up to 30 centimetres of sediment washed in by the tsunami now covers many agricultural areas.

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These sediments are too much to move, creating new soil structures that no-one has had to farm before. Complicating matters is the variety of sediments deposited, from sand to clay and almost every variable in between. Much of the sediment is laden with salt, and some of it with metals and minerals, but no-one is too sure what lies where.

In some places rainfall, of which Aceh receives 1500 millimetres a year, has drained the salt. Other areas lack sufficient drainage. How soil types, salts, minerals and water will interact with crops, and with each other, remains to be seen.

Determining these interactions is part of the work ACIAR will be undertaking in the region. Short-term scoping studies are underway and initial research will begin in the second half of 2005.

The aim is to identify likely outcomes of soil tillage, cropping and sediment-soil interactions. Understanding these will help to provide the technical information to underpin the development of projects, beginning late this year. They will aim to develop rehabilitation and management strategies for sediments and soils.

Eventually, guidelines for farmers built around the soil types and sediment characteristics will be developed.

Indonesian scientists in Aceh are already receiving training in laboratory analysis of soils. This is one of several courses underway or completed to build capacity in managing the unique circumstances left behind by the tsunami. The scientists trained will be involved in the scoping and project activities.

Initial work will concentrate on less-affected areas. Already some farmers in these areas are planting crops, mainly rice. The complexity of the challenge in front of ACIAR and its partners is now starting to emerge with the first rice plants – some are normal, others stunted and others still have not grown.

Knowing the reasons for this will help draw a clearer picture of the soil changes and their impacts on crops. Longer-term groundwater interactions and changes may also be mapped.

For areas where people have lost everything, rebuilding agriculture may take longer. Some of the worst of these are coastal communities that relied on the sea for a livelihood. Both aquaculture and wild fisheries harvesting have been interrupted.

A number of agencies are focusing on wild fish populations, coral reefs and coastal habitats and the tsunami's impact on these. ACIAR's project development and training will focus on two areas to complement these existing activities.

The first is socio-economic studies to ensure fishing communities match their resources and efforts with available catches. Aquaculture, of shrimp and high-value finfish, will be the second focal point.

Aquaculture, like other industries and agricultural enterprises in Aceh, has been devastated by the tsunami. Where once the land was dotted with ponds producing shrimp and other species, the same ponds are now covered by debris and mud.

Aceh and Nias (Northern Sumatra) used to have a vibrant fisheries sector. Indonesian government figures give an annual output of more than 158,000 tonnes in 2003 with about 15 per cent or 24,000 tonnes derived from aquaculture. The total value of capture and aquaculture production was more than $225 million.

Most of the fish caught were consumed locally or were exported, unprocessed, both overseas and to other parts of the country. The fisheries sector also played an important role in the economy, accounting for three per cent of Aceh's GDP and providing employment to more than 89,000 people (around 16 per cent of the population) in the disaster-affected areas of Aceh Province and Nias Island.

In March 2005, an ACIAR team visited the devastated province of Aceh to see how best to assist in the redevelopment of the area.

Thick layers of sediment washed in now covers many agricultural areas, creating unknown soil structures.

Debris in many coastal areas covers what were once aquaculture ponds.

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The team quickly recognised the need for outreach training to assist farmers in rebuilding and restoring their livelihoods as soon as possible. Dr Jes Sammut, of the University of New South Wales, leads an ACIAR project investigating remediation of degraded aquaculture ponds in South Sulawesi province of Indonesia. Together with his Indonesian research team, they have developed some simple solutions to soil degradation in shrimp ponds, treating problems of acidic soils, redesigning ponds and reconstructing pond dykes. Much is applicable to the situation in Aceh.

In response to the requests from Indonesian staff, the project team planned a workshop for fisheries staff, which was held in May.

"It was a monumental task," says Dr Sammut. With help from the Australian Embassy and ACIAR's Indonesia office, 26 fisheries staff from Aceh went to the workshop in Batam for training in methods of assessing ponds, soil type, and properties that farmers need to consider when planning where to site their ponds. It was felt that off-site training would give participants a break from the tragedy and help them to form working relationships with participants from other agencies.

"The trauma suffered by participants at the workshop was evident," says Dr Sammut. "Individuals were constantly remembering the tragedy and what they had lost. While survivors are willing to help the community, about two-thirds of fisheries staff were killed in the tsunami and their resources are limited."

The workshop covered basic field and laboratory techniques, including how to use, calibrate and maintain soil monitoring equipment. Two Indonesian postgraduate students who are studying with Dr Sammut at the University of NSW also attended the workshop. Akhmad Mustafa, an ACIAR John Allwright Fellow, who is doing his PhD research on pond remediation, is now recognised as a pond soil expert in Indonesia – an area which is very important for the country. Mr Sugianto, an AusAID fellow from Aceh, helped translate material and train participants.

Using a 'train the trainer' approach, the participants spent six days learning and practising the skills they would need to take back to Aceh and use in the field with farmers. A further four days were spent in Aceh conducting field-based training and planning future work.

More than 20,000 hectares of aquaculture ponds in Aceh were affected by the tsunami. The landscape has changed. Mud was carried from the sea and coastline, seawater has infiltrated soils and debris was deposited.

"It is a big challenge to remediate such a large area of ponds because the physical and chemical composition of the sediments is unknown," Dr Sammut explains. "In some cases ponds need to be completely reconstructed, in others raw acid sulfate soils have been exposed to the air and over the last few months have oxidised and generated large amounts of sulfuric acid. Now that farmers are having to rebuild, the concern is that the severely acidified soil will cause production problems – the last thing they need now is to lose a crop."

Many prawn hatcheries have also been destroyed. There is concern that remaining suppliers may not be rigorous with disease control as they try to satisfy the huge demand for seed stock. With another ACIAR project investigating disease control for small-scale shrimp farmers, the workshop organisers asked two researchers, Dr Murdjani and Mr Supito, to attend the workshop and lead a session on disease management issues.

Other problems include the lack of processing facilities; support infrastructure was destroyed or damaged and many community members lost houses, fishing boats, engines and gear.

The workshop resulted in the establishment of four 'constant' teams with the necessary equipment and a further two teams who will share equipment. These teams are now out working with farmers. Students at the fisheries high school are being trained in soil surveys and how to reconstruct ponds. Many will soon graduate and possibly take up local government positions in the fisheries sector. Another objective is to establish pilot trials and demonstration areas where farmers can monitor the effectiveness of the technology.

Recognising that in some places remediation may not be possible, Dr Sammut and his colleagues also trained the participants on alternative farming practices. Shrimp monoculture is a high-risk activity and so they provided information for farmers to use in making choices, such as farming other species (for example milkfish, juvenile shrimp production) or seaweed culture. Another alternative is sea cage culture.

As time passes in Aceh and Northern Sumatra and life returns to a degree of normality, the importance of agriculture in the livelihoods of many smallholders will grow. ACIAR's commitment, along with that of AusAID and the international community, will help ensure that in the medium to long-term, agriculture can meet these needs.