INNOVATION AND ENTREPRENEURS

The innovation made through ACIAR projects does not flow one way—experience gained overseas can stand Australian agricultural businesses and entrepreneurs in good stead.

BY DR WENDY HENDERSON AND DR GIO BRAIDOTTI

Global demand for forestry and fisheries resources has been growing over the past five decades. Demand for forest products (production and consumption of sawn wood) has risen from 358 million tonnes in 1965 to 417 million tonnes in 2005, and is projected to rise by another 100 million tonnes by 2020 (State of the World's Forests, 2009, Food and Agriculture Organization). The trend in fish consumption is also rising, growing at a rate of 3.6% per year since 1961 (World Health Organization).

With growth in demand comes opportunities for those able to supply value chains. The challenge is balancing growing demand with sustainable supply. Both the forest and fisheries sectors are vulnerable to over-harvesting, resulting in depletion of the natural resource base. Technical innovations that link sustainable approaches to long-term profitability can mobilise new investments and regional development opportunities.

ACIAR’s sandalwood projects are a case in point. Sandalwood is one of the world’s most valuable forest products prized for its aromatic oil that is also used in a wide range of products ranging from incense-joss sticks and furniture to perfumes and pharmaceuticals. Its value, however, has led to over-harvesting of wild stock.

Australia has moved towards establishing sandalwood plantations from high-oil-yielding stock. It is a new industry that uses silvicultural techniques largely developed through ACIAR forestry projects in the 1980s and 1990s.

The native sandalwood species growing in Western Australia (Santalum spicatum) supplies about half of the world’s legal sandalwood. A newer industry based on exotic Indian sandalwood (S. album) is now also emerging, concentrated largely in the fertile lands of the Ord River Irrigation Area (ORIA) in northern Western Australia.

This species produces a much higher oil content than its counterpart and is worth substantially more per tonne. Much of the S. album in its home countries has been over-exploited, so overseas supplies are dwindling, leaving Australia in a strong position to reap the benefits from its new plantations.

Growing sandalwood on a commercial scale is a fine art. Sandalwood is a hemi-parasitic plant (like mistletoe), taking nutrients from a host plant to use for its own growth through specialised root structures called haustoria. While many plant species, usually legumes, can be potential hosts, commercial-scale production requires identifying hosts best suited to nurturing sandalwood.

Further complicating matters, several different hosts are needed during sandalwood’s cultivation, depending on its life stage. In early seedling stages in the nursery, a ‘pot host’ is needed followed by at least one short-term intermediate host, which needs to be grown adjacent to the young sandalwood plants. Finally a long-term, larger host is needed to supply nutrients to more mature sandalwood in the plantation.

The best host for each stage is a different species with different properties, and needs to be chosen specifically to optimise its interaction with the sandalwood.

ACIAR funded sandalwood research with the WA Department of Conservation and Land Management (CALM) from 1987–95 in Indonesia and Australia. Dr Frank McKinnell, who led the research, says it formed the foundations for the current Indian sandalwood industry here.

“We were looking at the potential for a fast-grown plantation crop, so we knew there would have to be more than one host plant over the rotation,” Dr McKinnell says. “But we had no information on what hosts might be suitable nor what was the most efficient way to raise seedlings as a commercial operation.”

*The work carried out under the ACIAR projects developed reliable nursery techniques for mass production of high-quality seedlings, as well as demonstrating the practicability and value of several second-stage and third-stage host plants. Therefore, it laid the basis of the*
Indian sandalwood has evolved into a large-scale commercial industry in Australia. One of the major companies in this space is Tropical Forestry Services (TFS). It manages the largest amount of Indian sandalwood under plantation in the world, with 7,600 hectares of *S. album* in Western Australia, Northern Territory and Queensland. The company is due to complete its first major harvest in 2014, when trees reach the preferred harvesting age of 15 years.

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“Australia has the space, water, climate and technology to successfully grow and value-add to Indian sandalwood, so TFS believes there is a valuable opportunity in growing Indian sandalwood,” says Andrew Brown from TFS.

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An independent impact assessment of the ACIAR research has estimated large benefits for Australia—an estimated $936 million (in 2012 Australian dollars) return on the first harvest which is 100 times the initial investment by ACIAR and others in the plantation-related research. Returns of up to $150,000 per tonne are being achieved.

Benefits also flow to the local Indigenous community in the form of employment. TFS has an Aboriginal liaison officer in its Kununurra office who works to facilitate Indigenous employment opportunities within the organisation.

Private and public research on *S. album* continues, ever on the lookout for better trees, better hosts, and more efficient growing methods. Current ACIAR-funded research on sandalwood in Australia is focusing on another high-quality species that occurs in Cape York (*S. lanceolatum*).

This work involves partnerships with two Indigenous communities, the Queensland Department of Agriculture, Fisheries and Forestry, and James Cook University. It is showing promising potential for another new branch of sandalwood production in the far north.

Aquaculture also faces opportunities for technical innovation—particularly in hatchery technology—in the face of growing demand for seafood and sustainability concerns over wild harvests. It is an area where Australia receives many mutual benefits from collaborative projects, particularly with South-East Asian countries such as Vietnam.

ACIAR projects provide scientists with the opportunity to look at aquaculture technology for species that are new to Australia. Edible clams, pipis and sea ranching of sandfish are just some of the projects that improve opportunities for farmers but also aid efforts to restock wild populations.

Linkages formed between countries help expand production and trade activities, a process that can create new opportunities for Australian business investment. An example is the welcome mat that authorities extended to the Australian aquaculture industry to take up business opportunities in Vietnam.

Dr Le Thanh Luu, director of the National Marine Broodstock Centre in Vietnam, has told the Australian aquaculture industry that opportunities in Vietnam extend beyond aquaculture to the spin-off and supporting industries, such as facilities for intensive culture, feed mills for marine species, production of probiotics for environmental treatment and production of vaccines for the improvement of aquatic animal health.

“While Vietnam has excellent professional and personal relationships with Australian scientists, there are also investment opportunities for the Australian business community,” he says.