

Leucaena management in West Timor and Cape York (AS2/2000/157)

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Project number	AS2/2000/157
Project name	Leucaena management in West Timor and Cape York
Collaborating institutions	Australia: University of Queensland Indonesia: Balai Pengkajian Teknologi Pertanian (BPTP); University of Nusa Cendana (UNDANA); Udayana University, Bali
Project leaders	Associate Professor Max Shelton and Dr Jacob Nulik
Duration of project	1 January 2001 – 31 December 2003
Funding	\$428,718
Countries involved	Indonesia and Australia
Commodities involved	Beef cattle
Related projects	FST/1994/033

Motivation for the project and what it aimed to achieve

An applied research and development project was implemented in the Amarasi subdistrict and North Central district (TTU) of West Timor, Indonesia to improve the sustainability and productivity of cattle-production systems through improved feeding and husbandry.

In Amarasi, cattle fattening based on *Leucaena leucocephala* (leucaena) forage has been the major economic activity for the past 35 years and is the main source of cash income for smallholder farmers. In TTU, cattle are raised predominantly under an extensive grazing system on native grasslands, to produce store cattle for sale into the more intensively managed areas such as Amarasi.

The project involved collaborative partnerships between Balai Pengkajian Teknologi Pertanian (BPTP in West Timor and Lombok), the University of Nusa Cendana in West Timor and the University of Queensland. Udayana University in Bali and the Research Institute for Animal Production in Bogor played minor roles, were not visited and consequently their project activities are not reported.

Project activities in Indonesia were:

- socioeconomic surveys in Amarasi and TTU to determine key aspects of feeding and cattle management in both regions
- evaluation of new and existing forage tree-legume germplasm and study of vegetative propagation and seed production of the best accessions
- GIS-based examination of biophysical and socioeconomic attributes of the Amarasi system and of the potential to promote the system elsewhere in NTT
- training courses and field days to promote adoption of improved technology.



Feeding leucaena to cattle in Amarasi prior to sale to Kupang.

The activities in Australia were:

- research to determine the water-use efficiency (WUE) of key forage tree-legumes and management options to improve dry-season leaf production
- evaluation of leucaena management on rehabilitated land at the Comalco bauxite mine in Cape York
- investigation of the potential for use of leucaena pasture areas for live cattle exports that would provide a business opportunity for traditional owners in the region.

What the research project produced

The Amarasi and North Central Timor systems

We found that the Amarasi system was a commercially oriented, highly productive and sustainable method of cattle fattening. We found that there were feed quality and quantity limitations in the dry season but these could be overcome through adoption of the highly productive KX2 leucaena hybrid and *L. leucocephala* cv. Tarramba as components of the improved management approach being promoted by BPTP.

In TTU, the production system was predominantly extensive, with minimal management of cattle or feeding. Cattle ownership was associated with social status, with less emphasis on commercial production; cattle numbers were more important than cattle condition and, consequently, rangelands were being degraded due to overgrazing by cattle.

Economic analysis of several scenarios in both regions highlighted the excellent profitability (by local standards) of the Amarasi-style tethering and fattening systems compared with the poor profitability of free-grazing systems used in TTU.

Climatic and edaphic similarities between Amarasi and TTU indicated no biophysical constraint to the adoption of leucaena-based cattle-production systems in TTU. Limitations to adoption were socioeconomic factors related to the different feeding systems employed (free grazing instead of tethering), non-commercial attitudes to cattle raising and lack of access to higher-value markets.

We found that with regular visits to selected villages in TTU for cattle weighing and education of farmers, adoption of tethering, improved feeding and cattle management was possible. Where adoption occurred, farmers achieved improved growth rates and higher weaning percentages. Greater use of tree legumes and other forages close to the tethering areas was a key feature of this enhanced productivity.

Strong support from the district Bupati (policy and funding) and from Dinas Pertanian (in-kind) cooperatively linked the government agencies with clan leaders and farmers. We found that adoption of technology occurred where progressive village leadership was (a) supported by district and provincial governments, (b) received technical information for improved husbandry and feeding management and (c) received support for improved marketing.

New germplasm

The evaluation of forage tree-legumes showed that:

- new leucaenas, such as the KX2 hybrid and cv. Tarramba, out-yielded other existing forage trees and could be recommended as a valuable addition to forage banks for wet-season and early dry-season feeding in NTT.

Vegetative propagation of KX2 was successfully undertaken at Cendana University and seed production of cv. Tarramba was commenced at BPTP Lily Station.

GIS mapping

- GIS mapping indicated that most of East Nusa Tenggara province, with its tropical climate and soils of neutral to alkaline pH, was suitable for growing *Leucaena* spp. Socioeconomic factors such as location of animal populations and interest of farmers in commercial cattle raising were the most important determinants of where adoption of the technology was most likely to occur.
- The full potential of GIS mapping for planning areas suited to forage tree-legume development was not realised. We recognised the need to digitise soil and socioeconomic data to increase the precision of mapping.

Maximising water-use efficiency of forage tree-legumes

Our work on WUE showed the following:

- KX2 and cultivar Tarramba, the new varieties of leucaena, showed good WUE in Timor. WUE was improved by late wet- or early dry-season harvesting of edible forage as this reduced water use and leaf shedding later in the dry season.
- In Australia, competition from the associated grass in a hedgerow system severely reduced WUE of leucaena. Methods to reduce competition were suggested.

Grazing leucaena at Weipa

Our grazing trials at Weipa showed that:

- very good live-weight gains were possible from cattle grazing leucaena thickets on mined land at Weipa after mechanical treatment to make it accessible to stock
- the leucaena thickets cannot be satisfactorily eradicated by cattle grazing alone, due to high costs, and would therefore need long-term management
- there was much interest in Cape York concerning the potential for use of leucaena–grass pastures on the Comalco site as holding facilities for live cattle to be exported out of Weipa
- leucaena pastures had the potential to provide business opportunities and employment for traditional owners in the region.

Strategies for use of the rehabilitated mined lands were discussed at a land-relinquishment criteria workshop held in July 2003.



A leucaena cv. Tarramba plot for seed production and cattle fattening; photo shows 3 months' dry-season growth.

Capacity building

The capacity of our collaborative partners was enhanced by (a) frequent formal meetings in Bali, Australia and Timor to discuss and provide feedback on work activities, (b) training courses and field visits provided for farmers from Amarasi and TTU and (c) higher-degree training provided to BPTP staff member Esnawan Budisantoso and Comalco staff member Mr Ian Little.

Adoption—how the project outputs are being used

The project was primarily designed to provide information on the limitations and opportunities for enhanced cattle production in Timor. Extension activities were not a major component of this project although field meetings of farmers were held, primarily in TTU. Indeed, a follow-up participatory extension program designed to achieve scale-up of successful technology was the main recommendation arising from the project. The principal capacity achievement was the development of Dr Esnawan Budisantoso into a highly competent and well-organised research scientist in BPTP NTT. He has become the principal collaborator with international groups, especially ACIAR. The following were specific adoption achievements:

- There was recognition of the superior value of the introduced cultivar Tarramba, leading to strong unmet demand for seed. Both BPTP and Dinas Perternakan have established seed orchards of this cultivar and are distributing seed.
- The hybrid variety KX2, on the other hand, has not been successful. Due to propagation difficulties, large-scale vegetative production of cuttings has not been achieved.

Impact—the difference the project has made or is expected to make



The use of more productive trees for forage in NTT has significantly improved the productivity of cattle in Amarasi and TTU. *Leucaena leucocephala* (leucaena) is the principal species responsible for improving supply of fuelwood, reversing land degradation, and lifting the economic returns to and social welfare of the rural families.

The technology that has been developed is mature, relevant and ready for large-scale adoption. It is now critically important that the opportunity for realisation of this potential be grasped for the benefit of farming communities in NTT.

However, the project reviewed has had only a small impact to date, as this was not the main focus of the program. The full potential benefits of the R&D outcomes of this project will not be realised until significant scale-up of the technology occurs and there is wider transfer and adoption of the technology beyond the boundaries of the project.

The long-term indicators of the future demand for beef are currently good and there is no reason to expect a major change such as a sudden diminution of demand.

Since uptake of leucaena technology is very strong in Australia, working with farmers feeding leucaena in Timor has strong parallels with similar activity in Australia. There is strong synergy between the use of leucaena in Timor and in Australia. For this reason, participatory R&D in Timor provides knowledge and lessons relevant to Australian farmers and vice versa. There are thus strong benefits from this project for the northern Australian cattle industry.