

Prosopis (mesquite, algarrobo): invasive weed or valuable forest resource?

A briefing paper for local, national and international bodies responsible for natural resource management in arid and semi-arid regions experiencing invasions of weedy Prosopis

The *Prosopis* debate

Prosopis is an important topic of discussion and policy in many parts of Africa, south Asia, Australia and the Americas. Ranchers, farmers and ecologists are alarmed by the invasion of vast areas of land in only a few decades. They have put pressure on governments who, in turn, have told forestry departments to stop planting and begin eradication programmes. However, many farmers and artisans, as well as researchers, argue that the tree is a valuable resource. Eradication of *Prosopis* has proven to be extremely difficult or impossible, and there is a need to consider control through its exploitation as a resource. Better management of *Prosopis* can greatly reduce its invasiveness.

What are *Prosopis* trees?

Prosopis are valuable multi-purpose trees. Where native, in the Americas, there is a long history of using all tree parts and trading in *Prosopis* wood, food and fodder. However, when introduced to Africa, Asia and Australia, the indigenous knowledge rarely followed, and *Prosopis* remains under-utilised and unmanaged. *Prosopis* are fast growing, nitrogen-fixing, very salt and drought tolerant trees and shrubs. Most are thorny, though thornless types are known. Seeds are spread widely by animals that eat the pods, and trees develop a shrubby growth form if cut or browsed.

The weedy invader

Prosopis often colonises disturbed, eroded, over-grazed or drought-affected land, forming dense, impenetrable thickets. In pastures, grass cover and stocking density are reduced, threatening the livelihoods of ranchers or pastoralists. Invasions into agricultural land, along irrigation channels and water courses is also a major problem. The trees are believed to deplete groundwater reserves and to reduce growth of neighbouring crops. Several species have become weedy in native ranges, but it is where *Prosopis* has been introduced that the 'debate' is strongest, especially in Australia, India, Pakistan, South Africa, Sudan and much of the Sahel. The common species worldwide are *P. juliflora* and *P. pallida*



Prosopis pallida, Peru. Tree products include wood for timber, posts, poles, chips, charcoal, firewood; pods for fodder, flour, syrup, honey, resin gums, fibres, tannins and medicines.

in the dry tropics, and mainly *P. glandulosa* and *P. velutina* in the sub-tropics.

Are eradication and/or control the answer?

For over 50 years, a major eradication programme in the USA and smaller programmes in Argentina, India, Pakistan and Sudan have tried to eradicate *Prosopis* with a range of herbicides and mechanical removal. Some are effective for a short time but the *Prosopis* generally returns. Millions of dollars have been spent but still no cost effective solution has been found. Nevertheless, governments continue to implement new programmes, now aiming to control rather than eradicate invasions, using the same techniques. In some countries, biological control has been effective, for example in South Africa, where the seed-feeding bruchid beetles *Neltumius arizonensis*, *Algarobius prosopis* and *A. bottimeri* have been introduced from North America.

New knowledge applied to the problem

An international team lead by HDRA and funded by DFID, began a project in 1998 to gather the global knowledge on *Prosopis*. An important conclusion is that eradication is not a simple solution and there are many management and control techniques that can convert weedy stands into productive, profitable and sustainable agroforestry systems.

Management by exploitation required

Exploiting *Prosopis*

With the production of fuelwood, sweet pods and straight trunks for timber, exploitation of *Prosopis* can be a profitable use of otherwise unproductive lands. Markets are developing around the world but work is still required to promote *Prosopis* as a valuable product of the desert. Integrated development is needed, from basic stand management to product processing and marketing.

Based on cost/benefit analysis, national and state governments should strike a balance between the containment of *Prosopis* through current eradication and control programmes, and the development of profitable agroforestry land use systems through improved management.

(1) Application of improved management techniques



Above: *Prosopis* before pruning



Right: tree after pruning

Stand conversion and improvement:

- Weedy stands are thinned to 100-400 trees per hectare, in stages. Broad strips are cleared and cut stumps are removed manually or mechanically, or are treated by stripping the bark or chemically by applying used motor oil or a triclopyr/diesel mixture directly to the stump. Animals can re-enter immediately as these chemicals have little mammalian toxicity. Selected trees in the remaining rows are pruned to single stems at final spacings of 5x5m to 10x10m. The cost of the operation should be at least covered by the sale of charcoal, wood chips and/or small timber.
- Pruning appears to be the single most important technique in improving tree and understorey yields; weedy shrubs are turned into valuable, productive trees by removal of side branches. Regularly pruned trees are found to have smaller root systems, use soil water more efficiently and compete less with neighbouring crops and grasses.
- Stands can be improved by introducing thornless or high yielding varieties by grafting or interplanting.

Preventing re-invasion:

- *Prosopis* trees have many competitive ecological advantages over other plants but the seedlings are sensitive, rarely establishing under mature trees or in tall grass. Re-invasion can be minimised by maintaining a high-pruned tree canopy and improved understorey management, including reduced stocking rates.
- Destroying seed or limiting its spread reduces re-invasion. Biological control including the introduction of seed-feeding beetles has been effective. Also effective are the collection of pods for stall feeding or processing, or a change of livestock, as cattle spread seed widely, whereas sheep kill most seed eaten and pigs kill them all.

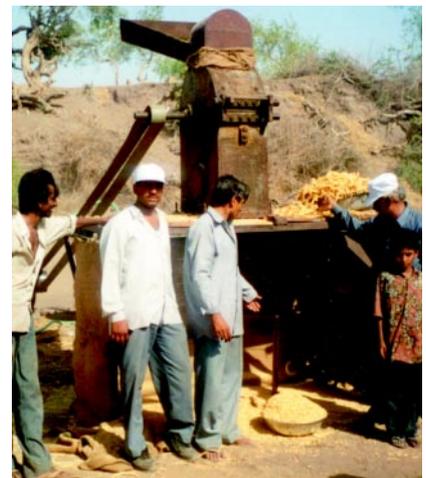
(2) Development and application of processing technologies



Promote collaboration between industry and research and development organisations:

- Improve pod and timber processing efficiency.
- Adapt wood and pod processing technologies for small-scale use.
- Develop high-technology extraction of high-value bio-products.

Left: *Prosopis* pod products



Above: *Prosopis* pod processing

(3) Commercialisation of *Prosopis* tree products



Right: *Prosopis* furniture

Promote *Prosopis* as a low-cost source of high-value products:

- Adopt international standards for *Prosopis* products, principally timber, pod flour and gums.
- Develop locally-made products for local markets.
- Identify 'niche' export markets.
- Promote nationally and internationally through trade fairs.

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