1-1-1994

Using saltland in Pakistan: an Australian connection

Ed Barrett-Lennard
Riaz Qureshi

Follow this and additional works at: http://researchlibrary.agric.wa.gov.au/journal_agriculture4

Part of the Hydrology Commons, Other Plant Sciences Commons, Rural Sociology Commons, Soil Science Commons, and the Sustainability Commons

Recommended Citation
Available at: http://researchlibrary.agric.wa.gov.au/journal_agriculture4/vol35/iss3/4

This article is brought to you for free and open access by Research Library. It has been accepted for inclusion in Journal of the Department of Agriculture, Western Australia, Series 4 by an authorized administrator of Research Library. For more information, please contact jennifer.heathcote@agric.wa.gov.au, sandra.papenfus@agric.wa.gov.au.
Using salt land in Pakistan – an Australian connection

By Ed Barrett-Lennard, Senior Research Officer, Plant Industries Division, South Perth and Riaz Qureshi, Chairman, Department of Soil Science, University of Agriculture, Faisalabad, Pakistan

Pakistan and Australia have a common enemy in salt. In each country millions of hectares of previously productive land have been affected by salt (or have the potential to become saline) because of inappropriate agricultural development. Since 1989 the Western Australian Department of Agriculture has participated in a research project in Pakistan which involves revegetation of salt land using Australian shrubs. Early results are very promising.

Salt has accumulated in this peanut-growing land at Sialiana near Faisalabad.

Department of Agriculture Research Officer, Richard Galloway, is pictured with a quailbrush, one of the most successful species growing at the Nowshera adaptation plot.
Because of these shortcomings, it was decided to try revegetation of salt land with Australian fodder shrubs. This had the added bonus that shrubs might help fill local needs for forage and fuel wood in which Pakistan has national shortages. National fodder supplies are estimated to be only 60 per cent of the total requirements. The most common fuel is dried animal manure but provision of alternative fuels would enable this to be returned to the fields to improve the fertility of the good cropping land.

In Pakistan the major cause of salinity is over-irrigation and leakage from irrigation canals which raises regional water-tables and draws salt to the soil surface. More than three million hectares have become saline in this manner, probably affecting 20 million people in this predominantly agrarian country.

The historical approach has been to return salt affected land to normal agriculture using drainage and reclamation schemes. This generally entails three steps:

- Lowering the water-tables using tile drains or by pumping the groundwater
- Adding gypsum to improve the soils
- Leaching the gypsum into and the salt out of the soils with good quality irrigation water.

Although some notable successes have been reported, there are two major problems:

- Heavy expense. (Capital costs of installing drainage and pumping systems are about US$110 per hectare drained. These systems have limited lives as tile drains eventually collapse and groundwater pumps corrode. Groundwater pumps are also major consumers of electricity, most of which is generated using imported oil.)
- Frequent lack of good quality water for leaching (even though drainage may be successful).

**Fodder shrubs**

Because of these shortcomings, it was decided to try revegetation of salt land with Australian fodder shrubs. This had the added bonus that shrubs might help fill local needs for forage and fuel wood in which Pakistan has national shortages.

Weight gain by goats feeding on mixtures of river saltbush and Kallar grass in Pakistan. One part of the saltbush to three of grasses boosted the quality of the forage.

River saltbush growing near Faisalabad makes an excellent forage for goats.

This research in Pakistan has been supported by the Australian Centre for International Agricultural Research (ACIAR). ACIAR funds research that is of national significance to both Australia and the recipient country. This is done by developing research partnerships between institutions in both countries. The partners in the Pakistan work are the Western Australian Department of Agriculture, the Institute for Sustainable Irrigated Agriculture at Tatura, Victoria and five institutions in Pakistan (three universities and two national research organisations). ACIAR funding supports research in both Pakistan and Australia. The research has four major aims:

- to determine which plants are best able to survive on salt land,
- to maximise the productivity of those plants,
- to determine the value of those plants as forages for animals, and
- to determine the economic benefits of salt land revegetation for local communities.

**Early results of the program**

The first phase of the research was to conduct species adaptation trials at six sites throughout Pakistan. These showed that survival and growth of the plants were most adversely affected by flooding. (Much of the salt land in Pakistan is flooded in summer during the monsoon.) The species typically grown on salt land in Western Australia were most tolerant to flooded sites in Pakistan. Saltbush was found to be a useful forage for mixing with other low quality feeds. Goats fed on river saltbush mixed with dried Kallar grass (a local forage) gained weight.

In view of the promising early results, ACIAR extended funding in July 1993 for another three years. The project is now undertaking further selection within the best species for tolerance to Pakistani conditions. There is also focus on the best ways of managing the shrubs for maximum productivity, further animal feeding experiments and studies of the economic benefits of salt land revegetation for local communities.
Social impact of project

One area where we have started to work directly with farmers is at Satiana near Faisalabad, once regarded as one of the most fertile areas of Pakistan but about 40 years ago rising water-tables caused by a leaky canal made the area waterlogged, saline and unproductive. Water-tables were finally lowered through a drainage scheme, but there was insufficient good quality irrigation water to leach the salt out of the soil profiles. Consequently much of the area is still saline today.

Most of the salt is at the soil surface so many farmers try to improve productivity by scraping topsoil off the fields and stockpiling it. This may be successful in the short-term, but salt eventually reconcentrates at the new soil surface and the process must be repeated.

The Satiana Association of Salt Land Users was formed recently in the area. This association was developed as an initiative of Mr Manzoor Ahmad (a local agricultural extension officer) and university staff. Farmers pay a fee of 29 Rupees (about $A1) and answer a questionnaire about their operations.

The answers given to these questionnaires show that the average farmer in the Satiana area has 10 hectares of land; half of which is saline. He estimates his loss of income due to salinity to be 65 per cent. His farm needs to support six people; his annual income is about $500 per person.

The Satiana Association only has 25 members but there is enormous potential to expand the association to reach much larger numbers.

Over the last four years I have visited an experimental site near the town of Nowshera in North West Frontier Province. This site is located on a farmer’s field where recent wheat crops have failed because of excessive salinity. Not far away is an area of saline wasteland dominated by a village of Afghan refugees. When our site was first planted in 1991, the entire area was flooded by about one metre of water for three weeks. Being slightly lower in the landscape, flooding in the village would have been more severe. Fodder and fuel shortages in the area are acute.
Survival of salt land shrubs after 12 months at three sites in Pakistan

Salinity and waterlogging had some adverse effects on survival, but flooding was particularly damaging. The Pindi Bhattian site was subject to flooding whereas the Bhawani and Sujawal sites were not. At Pindi Bhattian (EC, >1800 mS/m, shallow water-table, three weeks flooding) some of the saltbushes adapted to salt land in WA survived, but the rangeland saltbushes and bluebushes died. In contrast, most genotypes survived at Sujawal (EC, values >4500 mS/m, shallow water-tables, no flooding), and all genotypes survived at Bhawani (no salinity, no waterlogging, no flooding).

Genotypes were: river saltbush (1-3), a sterile cross of river and old man saltbushes (4), quailbrush (5), grey saltbush (6), wavy leaf saltbush (7), silver saltbush (8,9), bladder saltbush (10), a cross between silver saltbush and old man saltbush from Pintharuka (11), Atriplex stocksii - a native of Pakistan (12), small leaf bluebush (13), Gascoyne bluebush (14), spiny bluebush (15), five winged bluebush (16).

During my most recent visit I saw goats grazing poor natural grasses only a few millimetres high and women walking for several kilometres to dig grass roots for fuel. These events were occurring about a kilometre from our trial site on which 18-month-old saltbushes had yielded 5 kg of fuelwood and 5 kg of leaf per plant!

Land salinisation in Pakistan is a human rights issue as well as an agricultural issue. It is the poor people who are most affected by salinity. Poor people live on and own salt land - rich people do not.

If the land ceases to be able to support them, farmers abandon their properties and move to the cities where they join the disempowered slum dwellers.

To many people, salinisation of agricultural land and the consequent loss of that land to agriculture are great symbols of environmental destruction and rural decline. Its return to productive use must be seen as a potent symbol of environmental hope and rural renewal.

At Satiana, saline topsoil is often removed to make agricultural land more productive for cropping. This strategy usually only works for a few years.

Local women from Nowshera spend a large proportion of their time grubbing out roots of grasses to burn for fuel. These loads may be carried several kilometres to the village.