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BRINGING WHEATBELT SALT LAND BACK INTO PRODUCTION

By S. T. SMITH, Senior Soil Research Officer, and C. V. MALCOLM, Research Officer, Department of Agriculture.

INVESTIGATIONS carried out over many years on salt-affected land in the wheatbelt of Western Australia have shown that it is often possible to return salt land to productivity. This article suggests how this may be done.

Salt encroachment, to a greater or lesser degree, exists in many wheatbelt areas, in fact, in 1955, it was estimated that about one million acres were affected. While salt in the subsoil, either as free salt or dissolved in water is not particularly harmful to crops and pastures, it gives rise to problems when it accumulates at the surface of the soil. The task of bringing salt-affected land back into production is not an easy one, but the techniques outlined here have proved effective.

GENERAL SALT LAND TREATMENT

It has been shown that the main steps in reclaiming salt land are to maintain a roughened surface and to exercise careful grazing protection. The roughened surface breaks the surface seal thus allowing water to enter the soil. As the water passes downwards it washes the salt from the surface. Seeds are able to germinate and plants can then become established provided adequate grazing protection is maintained.

In this way, mildly-affected land can be returned to its normal usage. It must be emphasised, however, that patience is required, and repeated workings over several years are often necessary before benefits begin to accrue. This approach is, therefore, quite useful on land where salt encroachment is not excessive, but can be disappointing when the land is very severely affected. Such land requires very long periods of almost annual cultivation and re-sowing to re-establish annual pastures and crops. For this reason, salt-tolerant perennial plants are favoured for the more severely salt-affected land. These salt-tolerant perennials, once established, do not require annual re-sowing and thus

Fig. 1.—A good stand of Bluebush on formerly salt-affected land at Kulin. An undercover of grass has also become established.
These furrows were made by a nine-furrow mouldboard plough with only two shares operating. Seed of Bluebush has been trapped in the broken ground and plants are establishing on what was a bare salt flat.

the expense of costly and repeated working is avoided. Furthermore, their root systems are usually deeper and extend below the level of very high salt concentration.

There are many salt tolerant perennials but in this article it is intended to discuss only Bluebush (*Kochia brevifolia*), Old Man Saltbush (*Atriplex nummularia*), and Creeping or Trailing Saltbush (*Atriplex semibaccata*). There are all well suited to the rather severely salt-affected land in the eastern wheatbelt where winter waterlogging is not severe. They are all extremely salt-tolerant and, managed properly, can be quite productive. Each of these plants will be discussed in turn.

**BLUEBUSH**

(*Kochia brevifolia*).

This plant occurs naturally in widespread situations in the wheatbelt. The bushes are a dark-green colour and, if allowed, grow to about 2 to 3 ft. in height. The leaves which are small and rounded are full of water which may readily be squeezed out even at the end of a long dry summer. Most growth occurs in the period from November to April and profuse flowering takes place within this period. The flowers, when mature, are very light and papery and are widely scattered by wind. While this characteristic makes seed collection very difficult it also allows a very easy natural spread, provided suitable management is imposed. Bluebush has a very high feed value and contains more crude protein than subterranean clover. Values of 25 per cent. crude protein (on dry weight) have been recorded. It is eaten more readily in summer than winter but is always quite palatable. Its ability to recover from heavy grazing is astonishing and can possibly be partially attributed to its very deep root system.

**Suitable Soil.**

Bluebush is extremely salt-tolerant and can grow on some of the most severely affected soils in the eastern wheatbelt, provided they are not excessively waterlogged in the winter period. It appears particularly suited to our morrel soils but also grows quite well on most of the "heavy" or finely-textured soils. It readily colonises quite bare salt land.

**Planting.**

The seed of this plant is very small and shallow planting is essential. Unfortunately, fine seedbeds are not desirable on salty soils and probably the best way of achieving shallow planting on a rough
Fig. 3.—A furrow has trapped seeds of Bluebush and plants are well established where the ground was formerly bare.

Surface is to allow the seed to drop on to the freshly-cultivated roughened surface. However, any means of achieving shallow planting is reasonably successful. Planting should be done in the period May to July and the area should be completely protected from grazing for at least 12 months. It should be emphasised that, quite often, no young plants are visible until the following autumn, and one should not allow the area to be grazed on the assumption that planting was a failure. If the area is likely to receive excessive sand blasting, cereal rye should be sown in addition. Normally, however, young Bluebush plants establish better in the absence of competition from other grasses.

Bluebush can be sown at rates from a few ounces up to 2 lb. or more per acre. Only a few Bluebush plants may result from a planting of this nature. However, because of its natural seed dispersal it will spread quite readily from a few parent plants. To enable this natural spread to proceed it is essential to do two things. Firstly, grazing exclusion is necessary until the stand of plants desired is achieved. Secondly, the bare, smooth salt-affected surface between the established bushes must be roughened with an implement such as a scarifier or chisel plough or furrowed with a single-furrow plough or ripper in order that seed may be trapped. One of the accompanying photographs illustrates the effect of this furrowing on the trapping and subsequent germination of Bluebush seed.

Seed Availability.

Unfortunately, seed of Bluebush is not easy to obtain. Hitherto it has not been on the market but recently a stock firm has indicated that it may have a very small quantity. However, it is quite possible within the flowering period of this plant (January to May) to collect seed sufficient for the establishment of a few parent plants. By placing a sack over the foliage of Bluebush and shaking vigorously, seed is dislodged into the bag. By this means a pound of seed may be collected in the matter of an hour or two. A pound of Bluebush seed gives a large number of potential plants but even if only a few establish these can be a source of seed which, by natural spread, can establish cover on a large area. The importance of grazing protection in this process is emphasised.

OLD MAN SALTBUSH

(Atriplex nummularia).

This is one of the largest of the saltbushes sometimes growing up to 6 or 7 ft. in height and many feet across. The large leaves and stems have the characteristic whitish-green colour of saltbushes. Like Bluebush, most growth occurs in the warmer weather. The seeds are produced in the summer in huge bunches on the female bushes. While these seeds are ultimately dislodged they are not easily spread by wind and, as a result, natural seed dispersal is poor. Well-established bushes will produce a considerable bulk of
palatable feed of about the same protein content as subterranean clover. Bushes can be heavily grazed for a short period provided ample time is allowed for recovery.

Suitable Soil Types.

In the eastern wheatbelt, Old Man Saltbush grows reasonably well on most soil types which are affected by salt encroachment. Old Man Saltbush does appear to stand a little more winter waterlogging than Bluebush although even so it does not like “wet feet” in the winter.

Establishment.

Old Man Saltbush can be established from seed, which, as in the case of Bluebush, must be planted at a very shallow depth. Planting should be done in the period May–July, preferably after the winter rains have arrived. Unfortunately, germination is extremely variable and good success in one year may be followed by almost complete failure the next year. Subject, however, to receiving a favourable season, it is possible to establish Old Man Saltbush plants on quite salty soil. Grazing protection is essential. Subsequent spread of seed is dependent upon manually scattering the seed which is easily stripped from the bushes.

Seed Availability.

Seed may be readily procured by stripping seed-laden bushes. By this means several pounds may be collected in a few minutes. Seed may also be purchased from at least one of the local stock agents.

**CREEPING OR TRAILING SALTBUSH** (*Atriplex semibaccata*).

Creeping Saltbush grows with a creeping habit lying flat on the ground in a broad mat up to several feet in diameter and 3 to 6 in. in height. The leaves and stems are small and of the characteristic whitish-green colour of other saltbushes. Flowering in spring and summer the bushes produce an abundance of bright red succulent fruits which dry out to give dark red-brown seeds. Spreading of the seed occurs mainly by means of stock. The bushes, which are short-lived, normally die out after two years or so, but are replaced by new seedlings. Creeping Saltbush is extremely palatable and may be grazed out if adequate care is not exercised.

Suitable Soil Types.

Almost any saline soil in the wheatbelt will grow this plant satisfactorily although, as with bluebush and Old Man Saltbush, excessive winter waterlogging is undesirable.

Establishment.

This plant establishes very readily from seed which can be planted by normal planting methods in the period May–July, after the winter rains have arrived. Shallow planting is essential.
Seed Availability.
The seed of this plant has hitherto not been available as it is an extremely laborious process collecting seed by hand. However, in recent years one of the stock firms has been obtaining good supplies from South Africa. By sowing at the rate of a couple of pounds per acre it is usually possible to establish sufficient plants from which a further natural spread may take place on a very restricted grazing programme.

ESSENTIAL POINTS IN PERENNIAL ESTABLISHMENT

Although the establishment of these three perennials, Bluebush, Old Man Saltbush and Creeping Saltbush has been described it is worthwhile to emphasise two very important factors. Firstly, grazing protection is essential and sometimes it is desirable to exclude stock for up to three years in order to allow sufficient plants to establish a good cover. So often plantings appear to be a failure and stock are permitted to enter with the result that small plants barely visible are not permitted to survive. One cannot over-emphasise the importance of grazing restriction. Secondly, no matter how much seed of these plants is being spread by natural agencies they cannot establish unless they are retained on the area. In order to retain this seed it is essential that the area be roughened in some way. The use of scattered furrows up to 10 yds. apart in a checker-board pattern is a satisfactory and economical way of achieving the roughening desired. Seeds will collect in the furrows and will germinate after the water has washed the salt downwards.

SUBSEQUENT MANAGEMENT OF SALT TOLERANT PERENNIALS

It has been indicated that the establishment of these perennials may take a few years and almost total grazing restriction may be desirable within this establishment period. Once, however, a good cover is obtained, the area may be grazed as much as possible subject to the plants not being eaten out. Bluebush will stand extremely heavy grazing but, unfortunately, this is not so with Old Man and Trailing Saltbushes.

The majority of growth of these plants occurs in the summer time. Grazing during spring and early summer will restrict growth and, if very severe, cause the death of bushes. Fortunately, the greatest demand for feed from these bushes occurs in late summer and in autumn, and the bushes may be grazed fairly heavily in this season without ill-effects.

Once the perennials are established, a grass cover will gradually develop among them. This is very desirable, as it is believed that stock require dry grass to eat in association with these rather high feed value green fodders.

HAND FEED YOUR IN-LAMB EWES

The importance of providing supplementary feed for ewes during the last six weeks of pregnancy was stressed by Mr. W. L. McGarry the Officer-in-Charge, Sheep and Wool Section of the Department of Agriculture.

Six weeks before lambing is due to commence, the ewes should be given 1 lb. of oats per head per day. If paddock feed is scanty, a hay ration should be given in addition. A fortnight later, the grain ration should be increased to ½ lb. per ewe per day and after two weeks this should be increased to 1 lb. a day, and maintained at this level until the new season’s feed has grown sufficiently to make hand-feeding unnecessary.

Mr. McGarry said, that although hand-feeding in the first three months of pregnancy did not appear to benefit ewes and lambs to any marked extent, it was most important that the ewes should be gaining in condition during the last six weeks.

Under-nourishment during this period led to the birth of small, weak lambs which had a poor chance of survival. Under-nourished ewes were slow in commencing lactation and their milk production was reduced causing them to show less concern for the welfare of their lambs.
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