1-1-1962

Water for agriculture. 1. Water for agricultural purposes in Western Australia

Department of Agriculture, Western Australia

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

Recommended Citation

IMPORTANT DISCLAIMER

This document has been obtained from DAFWA's research library website (researchlibrary.agric.wa.gov.au) which hosts DAFWA's archival research publications. Although reasonable care was taken to make the information in the document accurate at the time it was first published, DAFWA does not make any representations or warranties about its accuracy, reliability, currency, completeness or suitability for any particular purpose. It may be out of date, inaccurate or misleading or conflict with current laws, polices or practices. DAFWA has not reviewed or revised the information before making the document available from its research library website. Before using the information, you should carefully evaluate its accuracy, currency, completeness and relevance for your purposes. We recommend you also search for more recent information on DAFWA's research library website, DAFWA's main website (https://www.agric.wa.gov.au) and other appropriate websites and sources.

Information in, or referred to in, documents on DAFWA's research library website is not tailored to the circumstances of individual farms, people or businesses, and does not constitute legal, business, scientific, agricultural or farm management advice. We recommend before making any significant decisions, you obtain advice from appropriate professionals who have taken into account your individual circumstances and objectives.

The Chief Executive Officer of the Department of Agriculture and Food and the State of Western Australia and their employees and agents (collectively and individually referred to below as DAFWA) accept no liability whatsoever, by reason of negligence or otherwise, arising from any use or release of information in, or referred to in, this document, or any error, inaccuracy or omission in the information.
WATER FOR AGRICULTURE

1. WATER FOR AGRICULTURAL PURPOSES IN WESTERN AUSTRALIA

By OFFICERS OF THE DEPARTMENT OF AGRICULTURE and the GOVERNMENT CHEMICAL LABORATORIES

The total soluble salts content of a water is the most important characteristic in determining the suitability of Western Australian waters for stock, irrigation or general use. Other quality characteristics are of secondary importance.

The soluble salts consist of various different salts, including common salt (sodium chloride), gypsum (calcium sulphate), Epsom salts (magnesium sulphate), Glauber's salts (sodium sulphate) and bicarbonates of soda, lime and magnesia.

In the agricultural areas of the State, about three quarters of the total salts is common salt, that is, similar to the total salts in sea water. The proportion of common salt is less in the pastoral areas and the northern parts of the State.

No natural water in Western Australia has been found to have a predominance of magnesia in its total salts; magnesia in water therefore has no special agricultural or domestic significance.

When the total salts in a water exceed the standards given below for various purposes, only practical tests will show whether the water can be used without ill effects, because varying conditions may vary the allowable maximum amount of total salts, particularly for stock and irrigation purposes.

None of the present known methods of desalting water, such as distillation, electrodialysis, de-ionisation or freezing is expected to produce water cheap enough for irrigation. Where a present water supply is expensive, future developments in desalting water may make the process economic for stock or domestic use. To date all such processes are too expensive for small scale use on the farm.

The salinity of ground water, particularly surface or shallow supplies, may change with time. It is not possible to forecast whether such change will occur or whether the salinity will increase or decrease, except that often there is an increase in salinity as summer advances and a decrease during winter.

The units in which total soluble salts are expressed in this State are grains per gallon:

1 oz. = 437.5 grains and 1 lb. = 7,000 grains.

THIS is the first of a series of articles on water for agricultural use in Western Australia. Others which will follow include clearing muddy water, the use of salty water for plants, effects of saline water on livestock and algae in farm water supplies.
In some States and other parts of the world, total salts are expressed in parts per million. Parts per million multiplied by 7/100 gives the equivalent in grains per gallon.

For comparison with the standards given below, Perth water supply from Canning and Serpentine Dams contains about 20 grains per gallon and sea water contains about 2,500 grains per gallon.

WATER FOR STOCK

The quality of water which stock will drink varies greatly with circumstances and conditions.

In this State the variation between the summer and winter salinity of the same water supply may be very great, and if stock have been accustomed to watering from one source, the gradual increase of salinity which occurs with increasing summer concentration may pass unnoticed by the animals which become accustomed to it and suffer little ill effect. If however, stock which have been accustomed to drinking fresh water, are suddenly put on to a very salt supply, it may be quite distasteful to them, and they may either refuse to drink it or suffer ill effects from its use. Stock thirsty through travelling, or under extreme conditions may drink and thrive for a short period on very saline water from which they would suffer if they used it continuously.

Such factors as these make the situation more complicated than it first seems, and although certain standards of composition are recorded, their application cannot be entirely rigid. It is generally accepted that:

- Water containing less than 200 grains total salts per gallon can be used continuously by all farm livestock.
- Sheep can tolerate water which is much more saline than that suitable for cattle, and
- Cattle are more resistant than horses and pigs.

The standards now in use in Western Australia as the safe upper limits of total salts in water for stock are:

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Grains per Gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>200</td>
</tr>
<tr>
<td>Pigs</td>
<td>300</td>
</tr>
<tr>
<td>Horses</td>
<td>450</td>
</tr>
<tr>
<td>Cattle (Dairy)</td>
<td>500</td>
</tr>
<tr>
<td>Cattle (Beef)</td>
<td>700</td>
</tr>
<tr>
<td>Adult Dry Sheep</td>
<td>900</td>
</tr>
</tbody>
</table>

Where green feed is available, the animals can tolerate more saline water than when "bush" or "scrub" is the only feed. Sheep have been known to live on water containing up to 1,300 grains per gallon of total salts for short periods, but success cannot be forecast with water as saline as this.

Older and dry sheep can tolerate water more saline than can young, growing sheep (weaners) or breeding ewes, and similarly for other stock.

Lambs, weaners and ewes in milk should be kept under observation if drinking water contains more than 700 grains of total salts per gallon.

Horses not at work can be kept alive on a more saline water than can horses at work.

As indicated in the table, dry or beef stock can tolerate a more salty water than can milking cows. However, water with much less salts than the maximum of 500 grains per gallon given in the table will reduce the milk production of high yielding cows.

WATER FOR IRRIGATION

The use of water for irrigation and domestic gardens is influenced not only by the amount of saline material dissolved in the water, but also by the type of soil and drainage, the climate and the rainfall. Often the unsuitability of saline water is largely due to the accumulation in the soil of the salts from the water applied.

The following remarks should therefore be taken only as a general guide, and it is emphasised that where the waters approach the maximum salinity for particular plants or where there are special conditions of drainage, soil types, rainfall, and so on, only practical tests will indicate the suitability of the water for the use in question.

More saline water can be used successfully on a well-drained light soil, than on
a poorly drained heavy soil. More saline water can be used in districts of high, though seasonal, rainfall, as the rain washes down the salts accumulated in the soil.

**General Standards**

In general, where the drainage is good, water containing up to 50 to 70 grains total salts per gallon is suitable for growing all types of plants, including the salt susceptible plants.

Water containing up to 100 to 150 grains total salts per gallon, is suitable for growing most plants other than those susceptible to salt.

Water containing up to 220 grains total salts per gallon, has been used for growing tomatoes, lucerne, cabbage and other salt resistant plants.

Above these limits, the growth and condition of plants or herbage must be closely observed, and if necessary advice should be obtained from officers of the Department of Agriculture.

Generally, 220 grains of total salts per gallon is regarded as approaching the maximum for safe watering of any plants. With such salt content, the drainage should be excellent and each watering should be of sufficient quantity to leach accumulated salts to a level below the root zone.

When the water exceeds 50 to 70 grains per gallon of total salts it should be kept off the foliage of plants which are not salt tolerant.

Where irrigation is not continuous, that is, if the water is applied very infrequently or only for short periods during the year, then water rather more saline than the above standards can be used.

**Salt Tolerant Plants**

Artichoke, asparagus, beetroot, buffalo grass, cabbage, cauliflower, celery, cotton, couch grass, cucumber, date palm, fig, Kikuyu grass, lucerne, mangels, melons, olive, *Paspalum vaginatum*, pumpkin, rhubarb, silver beet, spinach, tomatoes, Wimmera ryegrass.

**Salt Susceptible Plants**

Apricots, carrots, citrus, french beans, grape vines, maize, parsnips, peach, peas, potatoes, radishes, and seedlings.

Additional information on watering with saline waters and a more detailed list of salt tolerance of plants will be printed in future articles in this series.

There is no clear-cut dividing line between suitable and unsuitable water for either plants or animals. Just as plants and animals may under favourable conditions continue to live with water more saline than the figures quoted, so growth and production will in general decrease as the salinity of the water approaches the various upper limits quoted.

**WATER FOR GENERAL AND DOMESTIC USE**

1. **For domestic use and for human consumption** on individual farms the safe upper limit of total soluble salts is considered to be 150 grains per gallon.

   For human consumption the water should be clear, colourless, odourless and free from pollution or contamination by organic matter. The source should be protected from animals and selected so that it is not contaminated by polluted drainage from stock sheds and yards or septic tank outlets.

   The **hardness of water** (indicated by the difficulty in obtaining a lather with soap) generally increases as the total soluble salts increase.

   Hot water systems deteriorate more rapidly as the total salt content of the water increases. About 70 grains per gallon is considered to be a reasonable safe upper limit for total salts in a hot water system. Above this level corrosion and scale deposition are excessive.

   **For showers and baths**, water containing up to 300 grains per gallon can be used, especially with a salt water soap.

   Septic tank systems work satisfactorily with water containing up to 700 grains per gallon.

2. **The reaction** of natural water may be acid (sour; like diluted vinegar) or alkaline (like a weak solution of washing soda) or neutral, like pure water.

   Neutral or slightly alkaline water is satisfactory but acid water has a rapid corrosive effect on iron, such as pipes and tanks, and acidity should be corrected by
the addition of good quality builders' lime or hydrolime, the quantity depending on the degree of acidity.

The required amount of lime should be mixed to a thin milk with water and this mixed thoroughly with the bulk of the water. It is advisable to allow time for any solids in the water to settle out before drawing off clear water. After liming it is desirable to aerate the water (by splashing) before use to remove any excess lime. The lime may be added direct to a well.

Limestone may be used instead of builders' lime but takes longer to act. The limestone can be placed in the well, for example, as a cairn around the end of the intake pipe, or may be hung in a perforated bucket under the pipe entering the tank.

3. The brown staining or discolouration of buildings, paths, and so on by water, is due to the presence in some waters, particularly acid water, of iron in solution. There is no simple economic method of preventing this staining other than keeping the water off the buildings.

For domestic use, the addition of lime to correct the acidity followed by aeration by splashing, will throw the iron out of solution as a sludge, which should be allowed to settle and the clear water used.

Water containing iron compounds in solution may be clear and colourless when first drawn but become cloudy or deposit reddish brown iron rust on standing, due to the action of the oxygen of the air on the iron compounds.

4. The objectionable odour in some waters, similar to that of rotten eggs is usually due to the presence in the water of hydrogen sulphide, a poisonous gas. This gas can be removed by aerating the water, the most convenient method usually being to allow the water to splash freely into an open tank. The use of a splash board under the pipe entering the tank will help this aeration.

Other odours in water indicate some form of pollution of the source.

5. Coloured water, which may be yellow or brown due to the presence of organic matter in solution, are satisfactory for stock, irrigation or septic tanks but should not be used for human consumption. The removal of colour due to organic matter can be difficult and is not always practical or economic.

6. Cloudy or muddy water can often be cleared by the addition of good quality builders' lime at rates up to 4 oz. per 1,000 gallons or filter alum at rates of 3 to 6 oz. per 1,000 gallons or gypsum or plaster of paris at rates of up to 4 lb. per 1,000 gallons.

Further information on clearing cloudy waters will be printed in a later article in this series.

SAMPLES FOR ANALYSIS

Samples of water for stock, irrigation and domestic purposes, are analysed by the Government Chemical Laboratories, Adelaide Terrace, Perth, on compliance with the following:

A. Each sample should —
   (a) Be approximately one pint of water in a clean container which has been previously rinsed with the water to be tested.
   (b) Be clearly marked with the sender's name, address and date of sampling.
   (c) Be securely packed and addressed to the Government Chemical Laboratories.

B. At the same time, a letter should be forwarded —
   (a) Stating whether the applicant is a bona fide farmer, market gardener, grazier, etc., and that the analysis is required in connection with his business as such.
   (b) Stating the source of the sample, e.g., bore, well, spring, etc., and its depth, and the location number of the property from which the sample was obtained.
   (c) Enclosing the fee, normally £1 1s. per sample but which is reduced to 7s. per sample for those who qualify under paragraph B (a) above.

Should the analysis be required very urgently, this should be stated in the letter and the cost of a telegram added to the fee, when a telegram will be sent immediately the analysis is completed.
HAPPY OWNERS HAVE KEPT US FIRST IN THE FODDER CONSERVATION MACHINERY BUSINESS SINCE 1946.

WHY? WELL, LET'S LOOK AT CROP CHOPPERS. OWNERS TELL US ... WE LIKE THE IN-BUILT QUALITY AND LIFETIME WARRANTY. WE DON'T GET COSTLY BREAKDOWNS IN THE FIELD. THAT, AND CONTROLLED LENGTH OF CHOP ... NO SUCTION ... GIVE US BETTER SOIL-FREE SILAGE ... EASIER TO HANDLE AND FEED!

NEW HOLLAND

"First in Grassland Farming"

Owner approved

The machine that's proved itself in the field!

£795

MOWERS • RAKES • BALE • CRUSHER • CROP CHOPPER • FORAGE HARVESTER • LOADER • BALE BOOSTER • FARM & FORAGE WAGONS • PASTURE HARROWS

Please mention the "Journal of Agriculture of W.A.," when writing to advertisers
MAKE THIS SIMPLE POTASH STRIP TRIAL! Test your pastures now with cheap, simple POTASH strip trials, by applying free-running Muriate of Potash at 1½-2 cwt. per acre. For further advice and assistance consult your Local Departmental Officer.

In 1960, Australia used more potash for pastures than for any other crop! Potash for pastures has jumped from 1% of Australia's total potash usage in 1952 to 32% in 1960! From the use of potash you will get more clover and healthier clover, more grass and more palatable grass, fewer weeds and a more even sward, and bigger profits from your land and your work.

Write for our free pamphlet "POTASH for your PASTURES" to POTASH (AUSTRALASIA) PTY. LTD., G.P.O. BOX 3843, SYDNEY