

# THE HYDROLOGICAL SOCIETY OF S.A. INC.

C/o Water Resources Branch  
Box 1751, Adelaide, S.A. 5001

## NEWSLETTER NO. 68

## NOVEMBER 1990

### HEALTHY DEBATE ON WATER RESOURCES ACT

I am pleased to say that last issue's guest editorial has prompted others to think about the new Water Resources Act. That the Society's newsletter has been able to promote thought and debate about this important issue is terrific.

In this issue two letters which add to these thoughts are published. It is clear that there are different views on whether or not the new Act provides improved or lessened opportunity for effective resource management.

One thing of which we can be certain is that the people dedicated to managing our water resources will be doing the best that they can. If the legislation is found to be wanting you can rest assured that there will be strong recommendation for change.

It is also interesting to reflect on past newsletters and note how many articles deal with the more general topic of resource management compared with the technical aspects of hydrology. In this issue there are several articles directly related to hydrology and I hope you will find them interesting. I found the discussion of saltbush fascinating.

C Schonfeldt

### THE WATER RESOURCES ACT

Letter from Pierre Gebert

David Cole's "Guest Editorial" in Newsletter No. 67 makes interesting reading but is also likely to create the wrong impression.

Prosecution of diffuse source or minor pollution incidents was no easier under section 61 of the repealed Water Resources Act 1976. While it may have been easier to prove that waste came into contact with water, it was extremely difficult to prove -

- that the waste in fact came from one particular source and could not have come from some other source;
- that a particular person 'caused suffered or permitted' the waste to come into contact with waters. Not one single case of diffuse source pollution was pursued under this provision.

I agree that sections 42 and 43 of the new Water Resources Act would be ineffectual against minor individual pollution incidents where the impact of the pollutant is barely measurable. These sections were not designed for that purpose.

Section 46 of the new Act empowers the Governor to make regulations to

'prohibit, restrict or regulate a particular act or activity.....'

It is considered preferable to control the activity rather than the minute level of pollution it generates. This approach also has the advantage of being pro-active.

There is merit in considering the other ways in which the new legislation is intended to make it tougher on those who pollute our water resources -

- Increased level of penalties, viz \$1 000 000 (sections 43,44,52 and 53);
- Presumption that the owner of the land from which pollution occurs caused the pollution (section 47)
- Onus of proof on the polluter to show that he or she took reasonable care to avoid the pollution incident (section 48)

## WATER RESOURCES ACT

Letter from Harold Tuckwell

I thought that I was alone in the wilderness but David Cole makes me feel less lonely and gives me hope that there are more people with concerns about the reduced protection of the quality of our natural water resources now afforded by the Water Resources Act, 1990.

Prior to the drafting of the 1976 Act the experiences of water resource managers throughout the world, particularly in the other Australian States, were thoroughly investigated. In the field of water quality management one point kept shining through - avoid becoming involved in prescribed quality standards which lead to scientific disputation before and after the event.

- The Minister may clean up the pollution at the cost of the polluter (section 55) and this becomes a first charge against the land (section 79)
- The Minister may require corrective action before pollution occurs (section 56); a major advantage in water protection
- No longer can managers and directors hide from liability behind corporate bodies; they are personally liable (section 75)

While David is concerned that the new Act does not go far enough, it is interesting that other lawyers have expressed the opinion that the new legislation goes too far in changing the onus of proof for offences which carry such severe penalties. C'est la vie.

If I were a polluter I know which Act I would fear most.

David Cole properly points out that effective water resources management is of vital significance to the socio-economic and environmental well-being of South Australia. I submit that the protection of the quality of the water resources of the State is paramount to those views and the water quality provisions of the 1990 Act sadden me.

The combination of Section 61 and the definition of waste in the 1976 Act meant that the introduction of waste to waters, unless authorised under the Act, was an offence. The discharge of one cup of oil to the River Murray when in flood or one million litres into the Onkaparinga - each would be an offence. Discovery of an offence would have resulted in either treating the offence as trivial or an official rap over the knuckles or a stern warning or prosecution.

Provided that there was evidence that a person had caused, suffered or permitted waste to come into contact with waters without authorisation or without complying with the conditions of an authorisation, a prosecution had to succeed.

The level of resultant pollution of the receiving waters was relevant only in submissions on penalty.

There was a flaw in the Water Quality Part of the 1976 Act. No action could be taken against a person who disposed of waste such that, in due course, it would of a certainty come into contact with waters. An example would have been the disposal of piggery effluent to an unsealed pond in an area where there was an unconfined aquifer at a shallow depth with provably porous strata above the aquifer.

Proposals to eliminate this flaw in the 1976 Act have resulted in the development of the 1990 Act water quality provisions which, in my view,

#### AWRC - 7th AUSTRALIAN HYDROGRAPHIC WORKSHOP

[ Reporter : Robin Leaney ]

The workshop was held in Darwin between October 1-5 1990 and was hosted by the Power and Water Authority. It was attended by 70 hydrographers from around Australia, with some participants from New Zealand and New Guinea.

The theme of the workshop was "Hydrographers and the Environment" and many of the papers that were presented included hydrological case studies involving the monitoring of environmentally sensitive projects.

A field day was spent at Ranger Uranium Mine which is 260 km east of Darwin.

have resulted in the baby being thrown out with the bath water.

I agree completely with David Cole's assessment of the changes in the water quality legislation. I am very concerned that somehow the government has been persuaded to replace a most effective piece of water quality legislation, which needed only some additional direction, with what I confidently predict will be demonstrated to be ineffective.

It is amazing that this action was taken when the level of acceptance of the need for strong, straightforward and effective controls for the management of the State's natural resources has never been higher.

However it appears that my views are now regarded as those of yesterday's man. I trust that David Cole will not drop the subject, that he will be supported by water managers and that he will be successful in persuading the government that there is a need for changes in the Act.

The region has an annual average rainfall of around 1500 mm of which 90% falls between November and March.

All rainfall runoff from the dam site and water used in the processing plant is collected in one of four retention ponds to be disposed of by evaporation. Ranger employs 35 environmental officers including a number of hydrographers. Hydrographic activities include the measurement of water levels in the retention ponds, flows in adjacent creeks and lagoons of Kakadu and water levels at many groundwater bore holes.

A trade display by 16 manufacturers of water resources and environmental monitoring equipment was set up in the annexes of the convention centre. Also, for the first, the manufacturers were invited to give a short presentation outlining their products.

The main points that were raised at the workshop were:

- o Environmental issues can be emotional and political, and usually large amounts of money are involved. Hydrographers should be well placed to contribute towards the environmental debate but they must begin to think hydrologically rather than hydrographically.
- o The role of the hydrographer is changing. Today's hydrographer is required to measure a greater array of water quality parameters and perform a wide range of catchment management tasks.
- o The ever increasing use of solid state instruments and improved transducers has enabled the

automatic transfer of data from field to office via telemetry, radio or satellite.

- o The major thrust of the nineties will be towards the management of effluent and urban stormwater disposal. More field analysis is required. ("You can't manage what you can't measure")
- o The Acoustic Doppler Current Meter is a new and exciting development. (Refer Mark Harvey's article below)

The next Hydrographic Workshop will be held in Canberra in 1992 and will probably have a "Water Quality" theme. Anyone wishing to look at any of the papers from this year's workshop should contact either Mark Harvey or myself.

#### ACOUSTIC DOPPLER CURRENT METER

[ Reporter : Mark Harvey ]

In Australia and most other countries, river flows are measured to provide information for the management, use and preservation of water resources. A free interchange of ideas has resulted in similar techniques being used throughout the world. Authorities in all Australian states have networks of stream gauging stations to measure water quantity and quality.

##### The present situation

The techniques for the recording of flows in rivers and streams have changed little in the last 50 years. The basic method remains to continuously record waterlevel and derive flow by establishing a relationship between waterlevel and discharge.

A stream gauging station is constructed at a suitable site on the stream. This normally requires waterlevel and discharge measuring structures and support facilities. Real costs vary from a few thousand dollars for small streams to \$50000 or more for large streams.

Whilst waterlevel recording instrumentation has been modernised with data loggers replacing graphical recorders at many sites, basic discharge measuring techniques have not changed. Manual flow measurements are made at a range of waterlevels, from trickles to floods and a relationship developed between the two parameters. Arriving at this relationship can take many years depending on the frequency of high flows and the difficulty in actually measuring them.

All present techniques are labour intensive and require skilled staff to achieve acceptable results. The maintenance requirements of a network of sites is considerable and construction costs of new stations are high.

An alternative and more efficient method of obtaining a continuous record of river discharges from selected locations is needed.

##### Alternative techniques

Many methods have been used but none are particularly suited to long term continuous monitoring.

Methods include: computer modelling, channel analysis, dilution techniques, insitu current meters, cameras or rising bubble systems, electromagnetic, oblique ultrasonic, and ultrasonic doppler (drains & sewers).

#### ULTRASONIC DOPPLER SYSTEM FOR RIVERS

A transducer has been developed at the Centre for Water Research at the University of Western Australia using ultrasonics to provide the water depth and integrated mean velocity in a profile between the transducer and the surface (integrated mean sediment concentration will be a later development). Commercial systems presently on the market have been designed to measure point velocities in closed channels such as sewers. Having no profiling capability, they are not suitable for gauging open channel, spatially varying flows.

The Acoustic Doppler Current Meter (ADCM) has been successfully tank tested at the WA University and is now undergoing field testing at three sites of condition extremes from the north-west to the south-west of WA.

Using the ADCM there is no need for the structures of the conventional gauging station, significantly reducing construction and maintenance demands. It will no longer be essential to visit sites to try to obtain physical measurements, particularly in the following difficult types;

- river estuaries subject to tidal influences
- remote sites
- environmentally sensitive areas
- sites with variable tailwater
- circulation in waterbodies

The ADCM uses "coherent" acoustic doppler techniques to derive estimates of water velocity at user-specified locations in the vertical profile. At approx 0.8 seconds per velocity reading, it would be possible to get water depth and a 10 point vertical velocity profile about every 8 seconds if required.

Depending on channel size and shape the ADCM can be used either singly or linked together to define flow patterns. Data can be logged on the individual transducer or on a logger located on the bank of the stream and telemetered if necessary.

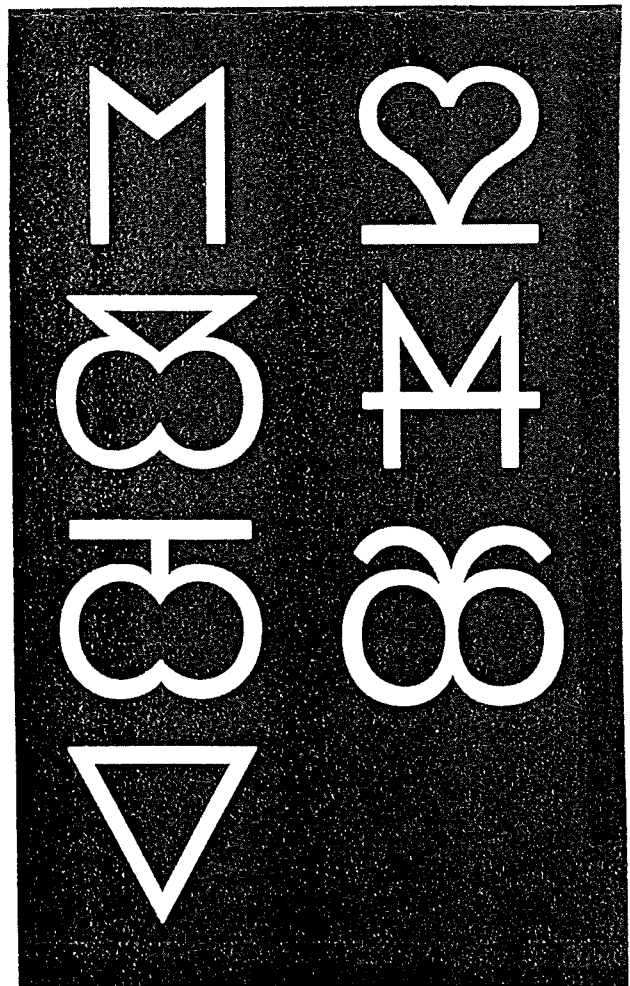
This development is unique and hopefully offers an opportunity to collect flows data economically from a range of existing sites and new sites previously thought too hard or simply not possible.

The Engineering and Water Supply Dept is supporting this development with a view to its usage in the future.

#### Acknowledgements:

Don Lewis, Centre for Water Research, University of WA

Ian Tite, Surface Water Branch, Water Authority of WA



What is the missing symbol?

## WITHER STATE GOVERNMENT HYDROLOGY IN THE ERA OF COMMERCIALISM?

[ Opinion by Richard Clark ]

The pun is meant because, from my viewpoint in the EWS Department, the practice of hydrology in the State government is in a very parlous position. The situation arises from the present dominance of the economic 'bottom-liners'. This situation saddens me greatly as I believe the view that hydrology is not relevant to a business-like approach merely underlines the present lack of awareness of the existence, importance and inevitability of the global environmental and social changes taking place.

The EWS is moving inexorably in the direction of becoming a single purpose water supply and sewerage authority. These activities have traditionally served the majority of its customers and it has a well established means of charging them for the services provided. If this narrow interpretation prevails, it will be very unfortunate for hydrologists working in the Department since, in essence, the River Murray has an over-abundance of water and existing pipelines and pumpstations are available to serve any increased demands within almost any corner of the State.

I am sad because if this narrow view prevails we may all be the losers. This is because the Department will be ridding itself of the very skills which it would need in the medium to longer term to save itself from commercial oblivion.

My reason for making this 'outrageous' statement lies in my experience of the enormous interest and quickenning activity by councils, organisations and individuals in the use of local stormwater and groundwater for providing alternative supplies to those reticulated by the EWS Department. It all seems so obvious! An urban wetland, coupled with groundwater recharge, can provide multiple benefits of flood mitigation, pollution reduction, increased land values, greater species diversity, happier citizens and cheaper

(and better quality) water supplies and (possibly) cheaper sewerage services also. Such schemes could be at least partially paid from the reduction of EWS rates they would provide to their developers under any 'pay for use' scheme and thus are very economically attractive.

Since the Department has invested so heavily in single purpose, fixed capital assets it is extremely vulnerable to a decrease in its customers patronage. Any significant sustained fall in the amount of water supplied must be translated into higher prices. As soon as the first of its customers permanently reduce their demand, others will increasingly wish to follow suit as the prices inevitably rise. An obvious precedent for this process lies in the plight of Australian National railways.

Hydrologists could avert this situation by being involved in the timely replacement of the inappropriate technologies now employed by the more environmental, social and economic 'alternative' systems and the development of alternative more economically and environmentally sustainable markets.

Ah well---! I remain convinced that such an involvement by hydrologists must inevitably happen. As a society we will all be better off if it comes about sooner, in a planned manner, than later in a competitive, conflicting and duplicative manner between State and Local Governments.

Stand by for further news! From my limited observation, similar situations may prevail in the other State Government Departments where hydrologists operate. If this is true, and the narrow momentum of 'commercialism' carries things the way they seem headed, the time may be soon here for hydrologists to combine to form a Hydrological Institute serving all levels of government and any other organisations wishing to pay. Come to think of it, it sounds pretty good to me!

# Saltbush Bob

Saltbush has a champion in the person of Bob McFarland from Oxley Station which is out "Hell, Hay and Booligul" way as Banjo Patterson described it.

Oxley which Bob manages, assisted ably by his wife Errolly, has 3400 hectares of Old Man Salt Bush and the balance of the 10800 hectare property is perennial saltbush and native grasses. Bob's smallest grazing paddock is about 2200 acres.

Bob's self-description is pretty appropriate. "I'm a product of saltbush mutton; I'm a bit short and stocky and I very much feel that saltbush has a wonderful future."

Bob, speaking at Hamilton Salinity Conference, opened his entertaining talk on the benefits of Old Man Saltbush (OMSB) with the above words and if ever a stock fodder had an enthusiastic disciple, Bob is the fellow! The following is an extract from his talk, notes and a conversation. We hope we have captured some of his enthusiasm.

"I'm a bit biased in the subject," (a comment which has to be as self-evident as sunrise), "I think saltbush is a wonderful plant, particularly the variety called *Atriplex nummularia* or more commonly Old Man Saltbush.

We recently went to South Africa and they are years ahead of us with Old Man Saltbush, and, after having a look at their country, I fail to see why we cannot do it and do it better in Australia.

This is a plant that was not created by scientists, but rather by Mother Nature and perhaps a lot of us should look to get back to this approach and avoid some of the problems of improved pastures.

I hasten to add that I am not blaming anyone; we need the scientists and researchers, where would we be without them, but we must not just let the scientists, chemists and drug companies do it all, but we landholders must work at improvements ourselves.

I graduated out of the University of Wide Open Spaces with a Bachelor BBA, which is a Bachelor of Bugger All, but because of my practical experience I have got something to offer, I have a vision, and I have got a terrific partner in saltbush.

I first looked upon saltbush as a drought fodder but having been to South Africa and seen what is happening there I believe it going to be an incredible pasture crop.

This is because of its longevity, wonderful root system and its terrific ability to overcome ecosystem problems through leaf drop.

It has a fibrous surface root system on the surface, intermediate root system and finally a massive tap root which I think is the secret of this fella's survival potential. Fifteen feet down is a long way to be pulling moisture out of the ground.

He can survive water-logging and drought: incredible conditions.

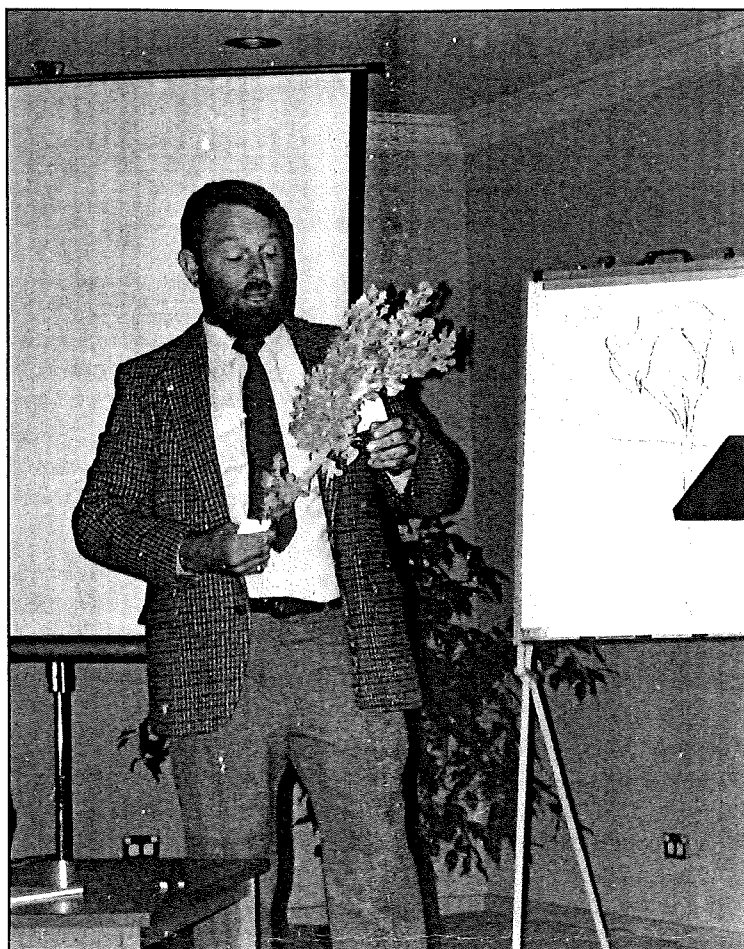
It is a truly remarkable plant and once established, can tolerate extremely dry, flooded and even burnt conditions. In '67 we had 28mm rain for the year and in '73 and '74 we had 900mm and 850mm respectively, two extremes of rainfall and Old Man Saltbush survived both!

Now I understand it won't survive high acid areas but I have seen it growing in soil of 4.5 to 5 pH, around Carathool. It won't grow in aluminium or ironbark country.

I believe Saltbush will play a big part in the discharge areas, but am less confident about recharge areas because of acidity.

There is another thing about OMSB and the winter. In the protein drought time in the winter how would you like to just wipe the kitchen window clear of the steam from your second cup of coffee and check how your stock are doing rather than be running back and forth in wet weather gear at the crack of dawn from silo to feed spreader to stock? Sounds good?

We don't own a silo, haystack, and subsequent handfeeding equipment, thus we have no headaches regards handfeeding stock during the protein deficient cold



*Bob McFarland singing the praises of Saltbush, or is he singing to it?*

winter months, OMSB has a protein level around 23% in the leaf and 16% in stem.

OMSB has a terrific ability to supply food as a winter feed. Its growth period is in the summer and it responds well to grazing, or pruning if you like, by animals.

You manage it by keeping stock off it in the summer, when there is plenty of other feed about and graze it back hard in the winter.

Stock will eat it back to stalks about a pencil thick and the plant loves it: it fights back sturdy and strong with immense leaf generation.

Irrigation people have the drop on drylanders as they can water their saltbush at will and the bush responds well.

This little table is pretty interesting! It represents the amount of water required by various plants to produce a kilo of dry matter

<b>Old Man Salt Bush</b>	<b>304 litre</b>
<b>Maize</b>	<b>369 litre</b>
<b>Wheat</b>	<b>507 litre</b>
<b>Lucerne</b>	<b>750 litre</b>

Now you salinity-affected people have a problem in that you want plants that will use heaps of water, you want to use them as a drainage system.

On the face of that the Saltbush looks a little ordinary. But I am excited about it. Just consider, if the same amount of water is available and the plants can use it, the Saltbush will provide twice as much dry matter as the high water using lucerne.

That seems like a pretty good deal to me, the water gets used and the animals thrive.

The down side is that you need to buy a bigger stock crate or make more trips to the market with the bigger, extra stock. True! We had to turn stock off early to get them small enough to get more than 100 into a deck of a triple crate.

This plant will be phenomenal in wetter country such as you have in Victoria and will probably make our arid land carrying capacity look poor.

Fine wool is the thing of the day, Merino sheep grown on Saltbush will micron finer, Saltbush is high in protein, low in fat, not like a lush pasture, sheep do not lose quality of their wool.

Our growing sheep last year averaged a growth of 7.8kilos and there is no improved pasture in that. More than 6000 of our 8000 are raised on Saltbush. Now I know that some of that weight gain is in the breeding but I reckon that a lot of the breeding is in what goes down an animal's throat. There is a lot of calcium in Saltbush so the beast also builds a good frame to hang all the extra meat on.

The worm problem that comes with improved pasture is also greatly reduced with Saltbush and it is a simple natural solution. The animal is eating above ground level so there is less chance of transfer, pasture area isn't reduced by the animals excreting all over it either. Now Avomec is great but it's about a dollar a drop, so not having to use as much is a great way to drop its cost.

In South Africa they run a big black faced sheep called a Dorper which is a meat sheep: with 38 million mouths to feed wool sort of takes second place. One place we visited ran these beasts continuously for four years on Old Man Saltbush

and they had an 186% lambing against their normal of 140% and their total flock has been averaging a 280 gram weight increase per day off the Saltbush. And it mostly goes into the eye of the meat as Salt bush is not a lush pasture solution. Fat Lambs is almost a dirty word these days.

One landholder has 10,000 Hectares of OMSB and running 40,000 sheep, and the bush is growing away from them! He is planning to run between 120,000 and 140,000 sheep on 20,000 hectares, not only that, but wait for it, he is actually going to replace all his lucerne. Of all the species he has tried from all over the World, OMSB is streets ahead in all areas.

With the attitude of D.I.R.T. (Do It Right To-day); that is always query something that your sub-conscious is telling you not to do. This is especially so in relation to your soil, they aren't making any more of it.

So many problems on the land are man made. OMSB can help reduce these dramatically, as explained earlier. Listening to all this you probably think that I consider this to be a perfect plant. Well let's say I believe it has a wonderful future but it has its problems and its main one is it is very poor germinator in the wild, and has to have a very careful establishment from the seed stage through to being established in the paddock. Thus it has been found here and in South Africa that seed-

I have a bit of concern with some of the advice being passed around about just fencing out saline areas. I reckon you ought to fence them out and fill them with some useful fodder crop. I will leave you to conjecture what I might recommend.

Saltbush is a practical tool that we can use in conjunction with scientific engineering and research.

I have a few random thoughts to finish with.

I firmly believe that sometimes our artificial remedies to problems build artificial problems along with themselves and Saltbush is a way around some of this.

I also reckon that the people who invented words did a great job because the important words make great acronyms.

DIRT is a good one and we have already discussed it, Do It Right Today.

SOIL is another great one, Save Our Indispensible Land.

It all really boils down to CARE, Conservation, Agriculture, Revegetation and Economy or Ecology."

**Editor's note.** If Bob's enthusiasm didn't show through it is entirely our fault. As an example of the effect he has on people, we can relate this little yarn.

Bob was reported in a local paper as enthusiastically giving a talk somewhere on the merits of Saltbush and among the readership was one Ted Nicholls from the NSW Forestry Commission. Ted just happened to be one of the judges for the NSW Agroforestry awards. The next day he rang Bob up at Oxley Station and the conversation went along the following lines:

**Ted:** "I read about your talk on Saltbush the other day and I wonder, do you reckon it is a tree?"

**Bob:** (Who I think reckons that OMSB is all things to all men.) "Certainly I reckon it's a tree!!!!!!!"

**Ted:** "Well I better come and have a look at your set-up, you may be eligible to enter the agroforestry awards competition."

**Bob:** "How soon?", (sensing no doubt, another potential convert)

The upshot of the story is that Bob and Oxley Station won the Agroforestry award that year with Old Man Salt "Tree".

## A tasty salt spot

Not only does Bob McFarland reckon that Old Man Saltbush is terrific to raise sheep on, he also reckons that the taste of OMSB fed sheep is better; juicier and much more flavoursome. "Three year mutton cooks like lamb and tastes better," says Bob. With a significant look at Errolly, he did mention that the cook had a lot to do with it.

A guest in the house came up with the memorable comparison, "Comparing Saltbush mutton with lamb is like comparing malt with blended whisky."

lings are the only way it can be planted successfully in a mass situation for evenness of growth and uniformity. With seeds it is only less than 30% successful, cuttings are too labour intensive and not as successful as seedlings.

So it is not "A Perfect Plant", it certainly has problems when a little bloke. In the wild it has a poor germination rate, only 20% to 30% of the seeds are fertile in any one year and the right conditions come along once in every ten years. But always remember we are talking about a plant that is going to last for upwards of 60 years once it is up and going.