



Report on Grassland Society of NSW funded study tour to Western Australia - April 4 to 11, 1998

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The study tour was an outstanding opportunity to liaise with pasture research agronomists - especially those involved with light soil pastures; leading farmers from districts including Badgingarra (north), Esperance (south) and Tincurrin (central); major seed industry personnel in Perth, Esperance, Badgingarra and Tincurrin; and the media (Editor WA major Agriculture newspaper "Farm Weekly").

The hospitality extended was wonderful, and the amount of information gained (and swapped) was great. I am extremely grateful to the NSW Grassland Society for allowing me the opportunity to undertake this tour.

This report highlights some of the major observations and pieces of information I gained on the tour. I feel there is no substitute for obtaining practical up-to-date information than on a trip such as this, where one meets face to face with the leading people undertaking the research, putting it into practice (leading farmers), and producing, processing and selling the new technology (seed producers, seed graders, seed processors, media, extension personnel).

Highlights

Serradella Dehulling

During the early to mid 1990's NSW Agriculture engineer, Keith Sanders (Trangie), developed a serradella dehuller, as part of a project to improve the seed germination rate (often serradella has 99 percent hard seed - therefore germination at sowing of untreated seed was very poor, and pasture establishment took years). Commercialisation of the dehuller did not occur.

However, Bradley Nutt and Steve Carr of CLIMA, WA, have successfully modified the Trangie dehuller. The initial engineering development by Sanders was regarded as outstanding - however adjustments were required to successfully process the different variety types. Currently three dehullers are working commercially in WA (none in NSW). Often a seed processor will hire a dehuller. On prototype de-huller inspected processed 60 kg seed per hour, however greater volumes are de-hulled with larger de-hullers.

From now on most serradella seed in WA (of

hard seeded varieties) will be marketed as dehulled seed (80% germination or better and three times as many seeds per kg than non processed seed) or "enhanced seed". "Enhanced seed" is still largely in-pod, but many pods have partially split, allowing for better germination. Germination rate of "enhanced pod" is commonly around 20%-30%, a vast improvement on non-dehulled seed (and generally better than the old, and now not practiced - hot water treatment method). "Enhanced pod" combines hard and soft seed, a combination some farmers will like.

"Enhanced pod", has about 35 percent the number of seeds per kg as de-hulled seed (similar number to untreated non de-hulled seed). Currently de-hulled Santorini sells in WA for around \$17.50 kg for sizeable quantities - excellent value. Around 500 kg dehulled Avila was currently available in WA (Trevor McDonald, Margaret river).

If NSW is to be a player in the serradella seed industry someone will need to invest in a de-huller and it's technology.

Cadiz Serradella for more general sowing.

Cadiz (Pink Serradella) is a more vigorous winter grower than other serradella (yellow) varieties. Seed supply is high in WA and it is likely to retail for \$1.50 - \$2.00 kg by next year.

Because many light soil paddocks are variable in depth and pH, researchers in WA feel farmers should consider including serradella in their sub-clover pastures. For example commonly 10-20 percent of a typical sub-clover paddock is too acid for optimum sub-clover production. Sometimes also the paddock contains deeper sandy to sandy-loam soil. Serradella can exploit moisture and nutrients at deeper levels better than subs.

An additional advantage of Cadiz (and other serradellas) is its ability to contribute greatly to spring feed supply (for hay, silage, or carry over feed). Often serradella stays green longer than sub clovers and can regrow better after a dry spell.

With cheaper seed there is an increased opportunity to sow Cadiz serradella direct into stubbles in the late summer/early autumn when pasture phases begin (perhaps after a summer perennial has been sown in some areas).

Cadiz and hard seed

By early autumn Cadiz commonly has most of its seed in the "soft" stage. Sometimes persistence after two or three years can be receding. In a long term pasture it is important to include a more persistent yellow serradella. Alternatively, with a cheap seed source consideration can be given to re seeding with Cadiz every two to three years.

New hard seed Cadiz

Bradley Nutt, CLIMA, WA, has selected hard seeded lines of Cadiz (up to 40-80% hard seed, June the year after seed set). These are yet to be tested for attributes such as winter production, but look promising. Some lines are also earlier in maturity (up to 10 days), and may well better suit drier areas. Commercial release is likely within two to three years.

Santorini yellow serradella

Reasonable to good supplies of this new line are now available. In Alison Bowman's (Trangie NSW), Col Mullen's (Dubbo), and my trials, Santorini has performed quite well - on average equal to or better than Madeira and Elgara. It is very acid soil tolerant (better than competitive varieties) and does not have extreme levels of hard seed. NSW data suggest Santorini should be recommended in the medium and lower rainfall areas of the state. Santorini is replacing all other past earlier maturing varieties in WA, sometimes being sown in conjunction with the other new line Charano.

Charano is slightly earlier than Santorini, very hard seeded, and in WA is doing well in drier and medium rainfall areas. It is also very acid soil tolerant, easy to harvest, and relatively easy to process.

87GEH 74A Serradella

This is overall currently the superior line in trials being conducted by Alison Bowman, Col Mullen and myself. If similar results occur in 1998 (trials will be in their third and fourth years) we feel sufficient data is available to proceed with the release of 87GEH 74A. WA have indicated they will not oppose the release of 87GEH 74A. 87GEH 74A is a yellow serradella that is three to four days earlier than Santorini. While a hard seeded variety, an advantage is a quicker break down of seed to enable greater germination levels in the autumn following first seed set.

Serradella seed breakdown

All yellow serradella varieties are regarded as having a high percentage of hard seed. However, the seed breakdown of some is more rapid than others. For example CLIMA research has shown varieties like 87GEA 72.1A, MCD111, 87GEH 74A and Avila break down more quickly with 40-50% of seed becoming soft by the autumn after seed set. Madeira and Elgara are intermediate. At the other extreme, varieties like Charano (87GEH56) and

Santorini tend to have slower break down of hard seed. However, Santorini has staggered seed break down over the autumn (to mid winter), which means if the first break fails, more seed will germinate at subsequent germination opportunities.

Serradella seed harvestability

Santorini and Charano have been partly selected for higher seed yields. Pods are straight and are retained on plants better than earlier released varieties such as Madeira or Elgara. Santorini and Charano also have improved tolerance to soil acidity, aphids and red legged earth mites.

Cadiz dormancy mechanism

While regarded as soft seeded, Cadiz has a temperature related dormancy factor. So while most seed is soft by early autumn, a good level remains dormant over the hot WA (mainly dry) summer.

Avila

Avila is finding new interest in WA in higher rainfall areas. Some de-hulled seed has been produced and is being marketed. It is anticipated the role for Avila will continue to expand in WA. In better rainfall areas mixtures of Avila and Santorini are being suggested, often in conjunction with other legumes, because of variable soil type.

Yellow serradella seed burial

Seed buried 2 cm during summer in WA trials has resulted in higher soft seed levels by autumn germination. Similar results have been found from David Michalk's research in NSW (darkness-temperature factors). Summer rain probably doesn't impact on dormancy.

Serradella Rhizobia

The release of the new strain specific to serradella (WSM471) can increase herbage yields by 20 percent in WA. The new strain has also performed well in NSW research (Greg Gemel *et al.*) and is now the strain used commercially.

Serradella persistence in the Esperance area

Peter Terrell was the original WA serradella commercial seed grower. I saw stands on his properties that were over 20 years old. Today, the paddocks tend to be cropped (direct drill) every second year and each alternative year they are self regenerating serradella and subclover pasture. This rotation works well in large areas of WA. Sometimes pastures are thickened up with re-seeding in autumn of the pasture phase if stands are considered a bit thin.

Old stands of Jebala serradella were also seen. In years gone by Tauro serradella (sold from Peter Terrell's properties) contained pink contaminants and these were almost certainly hard seeded types from Cadiz like plants (*Ornithopsis sativus*). These pink types have persisted well (and have appeared

to be productive suitable types) in mixed pastures for well over a decade (similar history of persistence in NSW from contaminants from WA purchased Tauro).

On Peter Terrell's properties barley is rotated annually with subclover and serradella pasture. Once a big pasture seed grower, this has now almost ceased because of wind erosion problems, especially with subclover.

Peter Terrell is currently also involved in seed cleaning, processing, and pasture seed retailing.

Casbah Biserrula

Research conducted by Angelo Loi, CLIMA, WA, has shown Casbah to be even deeper rooting than serradella (eg. in one trial Casbah rooted to 1.2m, serradella to 1.0 m and subclover to 0.6 m).

Trials in WA indicate an exciting future for Casbah. Initially the area of adaptability was thought to be the soils too poor for serradella (in the Mediterranean biserrula is found in soils too poor for other legumes). However, the view now is that Casbah will compliment serradella. In WA it's role is felt to be from the higher rainfall dairy areas to the eastern edge of the wheat belt.

Suitable soil types appear to be fine textured sands, deeper light to medium loams, those with an acidity range of pH 4.4 to 7.0, and some good success has been seen in shallow difficult soils. Root systems can penetrate difficult clay. Biserrula does not tolerate extreme acidity as well as highly tolerant serradella varieties (eg. Santorini or Charano).

Casbah's attributes include long term persistence, hardiness under tough growing conditions (probably related to rapid root development and ability to root deeper than other annuals), heat stress tolerance (can flower and seed when too hot for subs, and even serradella) ease of seed harvest and seed processing, high seed yields of up to 1.5-2.0 t/ha (cheaper seed), and high quality green and dry feed. A high level of seed in dry feed adds to its quality. However, 40% of seed can pass through animals as viable seed. Yields of up to 13 t/ha as hay have been recorded.

In trials inspected at Madeina a germination rain had been received during mid March, generally considered too early for persistence to follow germination of winter annuals. Hot dry weather followed. However, because biserrula developed roots so quickly survival of seedling was vastly superior to serradella and sub clovers (most of sub was dead).

Regeneration is better in the second year if biserrula is well grazed down by the time of the autumn break. This is also important for serradella and to a degree subclover. No grazing, no biserrula regeneration in second year (WA).

Casbah is susceptible to aphids (but not as bad as

several subclovers) although field experience in WA suggests it has a good ability to cope and recover (much better than subs). Biserrula is partially resistant to Red Legged Earth Mite. Biserrula is thought not to cause bloat but no definite information is available. Oestrogens tested for in other legumes have not been found in biserrula.

A rhizobia strain specific to biserrula is available commercially. Last year some commercial sowings failed to inoculate. Investigations (Professor John Howison, Murdoch University) are still ongoing and perhaps suggest the strain may have mutated at the commercial manufacture level. A further improved rhizobia strain is being used commercially this year (very acid soil tolerant). There appears to be no indigenous rhizobia for biserrula.

Harvested seed generally has a good soft seed level because "scarifying" occurs in the harvest, cleaning and grading process.

Paramount Seeds have one tonne for sale (10 tonnes harvested) available in NSW through Aus-West and Elders (some of the seed was produced by Evan Moll, Albury in NSW).

Paramount expect 35-40 tonnes to be harvested in 1998. The projected price in 1998 is \$7 kg and perhaps \$4 or \$5 by 1999.

Further Biserrula varieties

A number of new lines (50 in WA, a handful in NSW) are currently being assessed. Casbah is a result of limited screening. The future is bright for improvements in varieties. Some lines are less extreme in hard seed than Casbah. There is not a big range in maturity between selections collected (10 days maximum). Seventy percent of biserrula germplasm has yet to be looked at (200 collections not yet screened). The WA pasture research people feel biserrula is the most promising of the alternative legume group.

Hymenocarpus circinnatus is another new legume being studied in WA. Research has identified suitable rhizobia (Murdoch University - John Howison). The species is thought to have promise. It is very deep rooted, but not extremely acid soil tolerant. It is more a medic type plant, excellent winter vigour, but very susceptible to Red Legged Earth Mite.

Prolific Persian clover

Joe Felbar of Badgingarra is having outstanding results with prolific Persian clover on light sandy country with often high water tables that can be saline. These soils are often waterlogged in winter.

Salinity and rising water-tables

WA to the first impression is making an enormous effort to contain salinity and rising water tables. Large areas have and are being planted to water and saline tolerant trees and shrubs. Much ef-

fort is being undertaken to understand under-ground water flows (directions, source, quantities) and likely water quality issues. These include hydrological studies and monitoring. For example a landcare group at Tincurrin has spent \$70,000 on such investigations, the major aim being to keep a natural fresh water lake free of encroaching salty water. Progress seems to be impressive.

Wet area pastures

Some sub-tropical grasses doing well in areas with water tables close to the surface. Bambatsi panic, Kazunjula Setaria (best of setarias), and Splenda Setaria.

These areas tend to be overrun with rushes and sedges and are of little grazing value unless developed. Summer grasses are sown in a conventionally prepared seed bed in early spring and not grazed for the first season.

Perennial summer grasses

A number of farmers (example Joe Felbar) in the Badgingarra area (between Perth and Geraldton) are experimenting on a large scale with subtropical grasses where water tables are close to the surface. Summer rainfall is low (25mm total in each of last few years, and around 75mm long term average) but provided establishment is achieved (can be difficult) growth rates can be outstanding (up to 14 t/ha dry-matter). The benefits to the environment are believed also great - improved ground cover, less wind erosion, probably improved soil organic matter, and a draw down of the water table (water tables have often risen after clearing carried out in the last 20-30 years). In addition the potential to raise productivity is enormous.

Up to now large areas of so called poor quality light soils in the near coastal areas of WA have been regarded as poor value because of shallow water tables, often semi and waterlogged conditions in winter, and lack of suitable pastures. But with tolerant legumes, (Balansa, Arrowleaf clover, strawberry clover, prolific Persian clover) and adaptable subtropical grasses, these areas are heading for large productivity gains.

Not all the soil in such areas is poorly drained and has shallow water tables. Hence, the role of Cadiz serradella, yellow serradella and biserrula. Fertiliser use is also important, so is management, and strategic use of trees and shrubs.

Tree Lucerne

Large areas have been planted to tree lucerne across WA to combat rising water tables. There is a tendency to sow wider rows (up to 24 m) and plant legumes and perennial grasses, like Rhodes grass, between rows.

Drymatter production of tree lucerne is similar

to clover/serradella pasture where water table problems are absent, but much higher where they are a problem. Farmers generally regard tree lucerne highly, if properly managed.

Seed production at Tincurrin

Neil/Leigh Ballard, Tincurrin WA (325mm average rainfall) are major pasture seed growers as well as grain farmers and graziers. Seed crops last year included Casbah biserrula, Cadiz and Santorini serradella, sub clover and Orion sphere medic. Some seeds are grown under contract to various companies holding seed rights.

The Ballard operation not only shows the high productivity of legumes such as Casbah, Santorini and Cadiz in lower rainfall areas, but also their profitability for seed production.

Neil Ballard believes he can make better money from Cadiz, even at \$1.00 kg than he can from wheat or barley. Cadiz typically yields around 300 kg/ha but can yield over 1000 kg/ha at Tincurrin.

Seed Industry

I had an excellent opportunity to meet with several leading people in the pasture seed growing, processing, and marketing areas. I believe this contact is very important. In past years it has often been experienced that agronomists are promoting a variety but little effort has been made to ensure seed is being produced, properly processed, and market-ed.

Some of the seed industry personnel I met with are listed in the Trip Schedule detailed below.

Weed control in subs and serradella pasture

Roundup CT at 400-600 mls/ha and 400 mls/ha 24D/MCPA are commonly used to control broadleaf and grass weeds in legume pasture (spray graze).

Weed control - Rope wick application

Neil/Leigh Ballard have built a wide rope wick boom for control of mustards and other higher growing weed in pasture seed crops. The rope-wick is effective and economical.

Herbicide tolerance to serradella and biserrula

WA Agriculture have conducted several screening trials testing various herbicides on winter legumes (Bowran and Revell). Like us they have found Broadstrike damaging to biserrula. Biserrula was also sensitive to MCPA, Tigrex and Gramoxone. Cadiz showed sensitivity to MCPA amine and Tigrex. Simazine + Gramoxone can be very damaging to serradella and biserrula.

Cadiz and Casbah had good tolerance to Jaguar (500 ml/ha) and Simazine (750 ml). Cadiz and Santorini had good tolerance to Spinnaker + Diuron (150 + 300 ml), Casbah was moderately damaged.

Pastures and herbicide resistance

A number of researchers and farmers believe pastures will play an increasing role in combating herbicide weed resistance. (herbicide weed resistance is already a serious problem in WA). Pastures allow for opportunities to use low rates of hormone sprays in spray graze situations, hay or silage cutting to prevent weed seed set, and the use of low risk groups such as glyphosate.

Lime use

Considerable interest occurs across WA in use of lime. However, the growers I met were generally including acid tolerant species in their pastures, and if necessary acid tolerant cereals, and were using at this stage little lime. There was a general understanding that soils had become more acid but from their point of view not enough convincing evidence that they should yet be liming. There was a feeling trace elements such as Zn, Cu, Co and major element potash may need re looking at once lime was applied.

African lovegrass

African lovegrass, a summer growing perennial native to South Africa, is widespread along roadways (everywhere I travelled, including Perth airport) and on the edges of National Parks. Nobody I spoke to has ever seen it as a weed (Plants were in legume pasture paddocks at Madina research area) in pasture paddocks. Because of generally low summer rain and lack of summer green herbage it is readily eaten.

But on road edges (because of water runoff from the road) it can be quite dominant and National Parks people frown on it as a possible invader of native areas (this didn't appear to be a problem other than at edges).

Perennial Veldt grass

Also considered a risk to National Parks and common on roadsides. But doesn't survive normal grazing situations.

Summer growing pastures and summer weeds

Because WA has very little summer rain (generally speaking) pastures are almost entirely winter annual species based. Yet the native vegetation was invariably perennial shrubs and other plants which used soil water in summer. It is difficult to see how summer growing deep rooted plants can be included in their generally tight crop/ pasture rotations (the exception being areas with tree lucerne and sub tropicals on shallow water table areas).

So clearly summer weeds are going to be a possible user of any summer moisture and rising water tables are an almost universal issue.

Stinkwort and melons are common summer weeds of fallow but not generally considered all that

much of an issue (eg. Spray graze control common).

Gairdner and Fitzgerald Barley

Although a pasture study tour, I did meet with Allen Tarro, OIC, Grain Products Laboratory, Perth, and Barley Development Office Ors Venter, Esperance. There are large quantities of the new varieties Gairdner and Fitzgerald in seed sheds (eg. Peter Terrell at Esperance) and much interest in them. Both have yielded better than Franklin (also in NSW), have bigger grain, and may well be accepted as malt quality.

Take-all in Wheat and Barley

Research in WA has shown "take-all" severity is much worse on wheat (variety Spear) than barley (Onslow) under heavy disease conditions. I'm not sure if this is well known in NSW, it was news to me, but always suspected as being the case.

Trial data showed that at high yield levels no "take-all" yields of barley and wheat were nearly 5.0 tonnes ha. At high disease levels barley yielded 60 percent (around 2.7 t/ha) but wheat yielded less than 30 percent compared to unaffected areas (around 1.3 t/ha).

Lupins

I spoke about the problem of virus (CMV) holding back the lupin industry in northern and central NSW. Lupin breeder Wallace Cowling thought Wongi may be an improved option as it had better tolerance to aphids, the disease vectors. The breeding program is very mindful of our concerns and are endeavouring to find better virus resistance.

The WA lupin breeders are keen for us to have a look at the new extremely acid soil tolerant yellow lupin variety Woodhill. It has immunity to CMV, resistant brown leaf spot and Pleiochaeta root rot. Grain quality is very high. But Woodhill may be a bit too susceptible to heavy frosts, and is very susceptible to anthracnose.

Conclusion and further contact

I believe I gained an enormous amount of valuable information from this tour and I hope this brief report is of use to readers. Anyone wishing for additional comment or details please contact me anytime at:

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