



Alfalfa seed in the US

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in a nutshell

- The average seed yield of seed alfalfa in the US is 1000 kg/ha, which is almost twice that of yields here in Australia
- Water management is quite different in that the lucerne growing areas are over a perched watertable
- Leading seed lucerne growers in the US plant single purpose lucerne stands, which means they are not pushed to produce good hay yields before being locked up for seed production
- Varietal selection in the US is based on seed yield not on plant longevity as here in Australia – most stands are kept for 3 or 4 years
- Seeding rates are lower in the US, so that the plants will have room to crown out in the second year

A visit to the world's leading lucerne seed production area, California in the United States of America, revealed that growing conditions and agronomic practices vary quite a degree to those in Australia.

In October 2007, I was fortunate enough to be invited to participate in a 10 day study tour of some of California's irrigation districts with Luke Kirkby of Premier Seeds Australia, to learn more about growing irrigated seed lucerne. The trip was funded by RIRDC & Premier Seeds through the "Irrigation Management of Seed Lucerne on Raised Beds" project.

The US is the obvious choice when wanting to learn more about growing irrigated seed lucerne (called alfalfa in the US). The US is reputedly the largest alfalfa producer in the world, with the leading alfalfa growing states being California, South Dakota, and Wisconsin. The average seed yield of seed alfalfa in the US is 1000 kg/ha, which is almost twice that of yields here in Australia.

We visited a number of seed lucerne farms from El Centro (Imperial Valley) in the far south of California to farms in Woodland (Sacramento Valley) near Sacramento.

Extreme heat & monsoons limit yield

The city of El Centro is home to the family owned and run Allstar Seed Company. El Centro is located about 20 miles north of the Mexican border, in the Imperial Irrigation District and has about a 3-inch (75 mm) annual rainfall. The irrigation district is 10-30 meters below sea level and receives its water from the Great American Canal, which is diverted from the Colorado River before it reaches the Mexican border. Allstar Seed Company grows, treats and sells lucerne, Bermuda grass (couch grass), Sudan grass and wheat seed.

On the Allstar Seed Company properties, seed lucerne is

sown at 4 four pounds per acre (4.48 kg/ha) on 40-inch raised beds with 6 six rows per bed. The crop receives three waterings during the season, all of which are applied at night to minimise evaporation in the hot dry region. Before harvesting the seed, the stand is cut 3–4 times for hay. The stand is usually kept for four years.

Seed yields in the Imperial Valley are quite variable but are generally considered a lot lower that those achieved in the top yielding San Joaquin Valley. Crops are planted to be dual purpose (hay and seed) with old public varieties such as Cuf 101 being the most popular variety. The extreme heat



Figure 1: Central Valley in the state of California, USA (source: Wikipedia)



experienced during flowering in this part of the state can be part of the blame for lower yields. Crop yields can also be decimated with monsoonal type rain that occurs every now and then. Sounds odd that a region that has an average rainfall of 3 inches has monsoonal rain!

From El Centro we travelled north to Bakersfield which is located in the south of the Central Valley. From the map (Figure 1) you can see that the Central Valley is a large, flat valley that stretches nearly 600 km from north to south and dominates the central portion of the state of California. Its northern half is referred to as the Sacramento Valley while its southern half as the San Joaquin Valley.

Records used to schedule irrigation

Bakersfield, which is located in Kern County, is not only the home to over 85% of the state's 43,000 oil wells (Kern County accounts for one-tenth of overall US oil production, and three of the five largest US oil fields (Wikipedia 2008)) but also to Blake Sanden, Irrigation and Agronomy Advisor with University of California. Among the various interesting facts that Blake shared with us, was the claim that most farmers in the Kern County use weather data and historic water use figures to schedule irrigations.

After touring Kern County we continued north to an area known as Five Points (named so because it is where five roads meet!) which is around 50 km south west of Fresno, to meet John Diener, the owner of Red Rock Ranch. John farms around 7000 acres (about 2800 ha), grows a wide range of crops including maize, lettuce, seed safflower, seed sudax, seed wheat, garlic, onions, cotton and tomatoes. He is also a very successful seed lucerne grower.

John sows his new lucerne seed stands in October at 3 pounds/acre (3.4 kg/ha), in three rows on a 60-inch raised bed. The crop is established with the use of spray irrigation (the most common method of establishing irrigated field crops in California). Subsequent irrigations are performed using flood irrigation (furrow). In March the stand is cut (or clipped as they say in the US) for hay. After this first cut, the

stand is sprayed with sulfuric acid. This acid spray is applied for a number of reasons, the most important being to control Golden Dotter (a weed that is not commonly found in lucerne seed production crops in Australia). This acid spray also helps to slightly acidify the highly alkaline soils (pH 8–9) and to even up plant growth to ensure even crop growth coming into the crop's seed production phase. The crop is irrigated after the acid spray, to promote new growth.

In May the stand is given a good watering prior to flowering (or bloom) so that the soil profile is full. June sees a quick shallow watering, while only the dry areas (those without a perched water table, which is at 4 feet) receive any water in July (which is done with sprinklers). The crop is then harvested in August. Finally the stand is irrigated in September to enable the crowns to store carbohydrates for the winter.

Using this recipe, John usually harvests around 1400 pounds/acre (1569 kg/ha) of uncleaned seed. John does not use any soil moisture monitoring, but rather looks at the colour of the crop and the physiological development of the plant to determine when the crop requires irrigation (eg the crop may require more water if it is in the middle of pod fill).

Perched watertable makes a difference

Last season Luke tried to manage the irrigation scheduling of a number of lucerne seed crops around the district in a similar way to this method. He found, due to the lack of a perched water table, that most crops required an extra irrigation especially during flowering. The lack of a perched water table in the areas we are growing lucerne seed in the Riverina would be the reason for this.

Good technology needs good management

From Five Points we made our way to Fresno where we met with Dr Shannon Mueller, a University of California farm advisor who specialises in lucerne seed production. We discussed a range of methods for scheduling irrigations



Figure 2. Spray irrigation is used to pre-irrigate fields and germinate seeds; following irrigations are applied down the furrows.



Figure 3. Sowing lucerne seed.



and Shannon explained that for many years she and the University have tried to get growers to adopt the use of soil moisture monitoring equipment. Growers were not interested because yields at demonstration sites where moisture monitoring was carried out were only half of what the growers were achieving on their own farms. The lower yields were a result of the inexperience of the demonstration site manager in growing seed lucerne and were not actually a reflection on the moisture monitors used. It shows that even with technology poor management decisions can still be made.

Our final destination was Woodland located near the Californian state capital Sacramento. Here we met up with Cal/West Seeds representatives. Cal/West Seeds is a grower owned cooperative which has one of the largest seed breeding programs in the USA. At Cal/West we were given an insight into methods used for breeding new lucerne varieties and how new varieties were selected and developed. Cal/West Seeds has Premier Seeds managing their production in Australia for which seed that is produced is exported to Saudi Arabia, Argentina, Mexico and back into the USA.

Why the yield difference?

So why do our US counterparts get such higher seed yields than we do here in Australia? I believe that the advantage of a perched watertable for the plants to tap into is only part of it. In the US, the leading seed lucerne growers do not plant dual purpose lucerne stands. If they intend to grow a seed crop they manage the plants for that purpose, which means the stand is not pushed to produce good hay yields before being locked up for seed production as they are often done here.

Also, varietal selection in the US is based on seed yield not on plant longevity as here in Australia. Most stands are kept for three or four years only (compared with six here in Australia). Seeding rates are lower in the US, so that the plants will have room to crown out in year 2. Many Australian farmers have higher seeding rates as they are more concerned with getting good ground cover and thus higher hay yields in the first year, which crowds the plants in future years.



Figure 4. Healthy stand of lucerne ready for last cut of the season.

Added facts discovered

During the 10 days spent in the US I learnt much more than just how they grow seed lucerne in California. One of the most interesting things I learned was how the Salton Sea was formed – a depression 69 metres below sea level and at an area of 974 km², the largest lake in California, where all the drainage from the Imperial Valley ends up. Luke told me the story of how during a flood, the banks of the Colorado River were breached and water ran into the depression for nearly two years before some train carriages were “donated” to help build up the river bank again. This story had the making of an urban myth and appealed to me, so on my return I decided to investigate it further.

In 1905 excessive flooding caused the bank of a diversion channel to burst, where “cutback erosion of the soft soil in the channel deepened it and created a steadily-growing waterfall that worked its way back towards the location of the river intake, with the falls at one point reaching 100 feet in height” (Wikipedia). The entire volume of the Colorado River flowed freely for nearly two years into the Salton Trough. There were fears that the cutback erosion would continue, permanently diverting the flow of the river to the Salton Trough. These fears prompted the Southern Pacific Railroad to spend over \$3 million to stop the flow, with success occurring in 1907 when the river again flowed towards the Gulf of California. A happy ending and the birth of an urban myth.

I would like to thank Premier Seeds Australia and RIRDC for giving me this opportunity to learn more about growing seed lucerne and also visiting some of the most productive and diverse agriculture areas of the US. 🇺🇸

Further information

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Figure 5. Making good use of old trailers – this pro-irrigation advertising is a number of years old.