

**Experience with rotations and cover crops in dry Australian environments**

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To my dear Argentinian no-till friends, congratulations! You have prevailed and been rewarded, your government has changed and you now have more freedom to farm! The noble way that you have suffered has brought about this freedom, I commend you all. Three years ago I recall my good friend, Cesar Belloso say to the Congress “We are going through a long dark tunnel and let’s hope we can survive to get to the other side” and you have, brighter days now do seem likely.

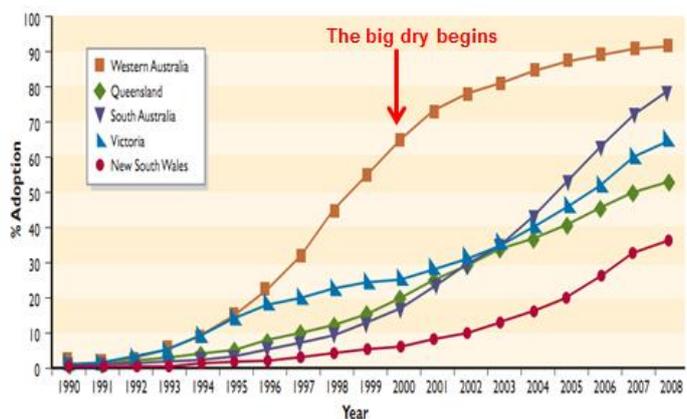
It is clear that cover crops are an important part of sustainable agriculture for much of Brasil and they may play an important role in large areas of the USA. However, for dryland Australia, I think they are likely a waste of water, sunlight, time and money. All agricultural regions have different crop yield restrictions. Remember Liebig’s Law of the Minimum and for us, water is the main one!

I do not think that cover crops are useful for Prairie Canadian farmers, nor are they likely sensible in low rainfall and cold areas of Argentina. For northern Argentina, where rainfalls are more reliable and consistent and more heat units exist, they will play a useful and perhaps vital role.

**Australian Background**

The adoption of no-tillage in Western Australia was early and rapid, beginning with reduced tillage in 1970’s and no-tillage from 1990 with near full adoption by 2000. Each State has its own no-till farmers group, and I happily had a role in the formation of three of these. These groups have been keen supporters of no-till and cropping innovations. The idea of cover crops was bought into Western Australia when I took farmers to Brasil in 2001 and met Ademir Calegari and Rolf Derpsch. We were also keen to learn if warm season crops could be grown with encouragement from Dwayne Beck in South Dakota, who earlier also encouraged us to think covers.

Estimated rate of adoption of no-tillage for Australia states (Crabtree).



Australia is a dry continent and most of our agriculture occurs in the south western and south eastern coastal fringes of the country in mainly the 300-500 mm rainfall zones. Only one crop a year can be grown as the country is too hot and too dry. Much of the cropping zone is located in a Mediterranean climate of winter wet and summer dry. Also, most of our soils are sandy and naturally



infertile and our duplex soils can waterlog readily in cool winters in even average rain years.

The end result of experiments with warm season and cover crops (mostly black oats), from many attempts on large and small scale, was disappointing.

Many good no-till farmers caught the enthusiasm and lost a lot of money trying to adopt ideas that were not suited to our environments. I too contributed to their loss by promoting it cautiously and then I reversed my enthusiasm based on the ideas promoted not stacking up in our environment. Now, I am seen by some and there is evidence for this on Twitter, as a critic of this “new” cover crop idea by some. However, ideas need to be tested and scrutinised sincerely.

The Australian crop, of which near 95% is a mild winter crop, is mostly challenged by ryegrass and radish weeds. On paddocks where weed control is a challenge most farmers have adopted pastures with sheep grazing, oats for hay, brown manure (sacrificial crop) or a canola Roundup Ready cash crop (since 2010), or a combination of all these.

#### **Why knife openers are popular and not disc openers**

The constant weed challenge (including herbicide resistance concerns) and our hot and dry climate make knife point openers preferred over the disc openers. The knife openers, with no-tillage, with less than 20% topsoil disturbance, do leave the weed seeds on the surface and ensure a consistent 1-4 cm soil covering over the weed seeds treated with the herbicides which are applied immediately before sowing (IBS) .

This knife opener technique gives highly effective weed control and it is difficult to overstate its value to our farming system. Such gentle and consistent covering of the weed seeds in a herbicide band is only possible with the knife point no-till openers and it is not possible with disc openers. The use of repeatable 2 cm GPS auto-steer driving accuracy has made knife openers capable of smoothly seeding through higher levels of residue in our environment.

A similarly powerful benefit of knife point no-tillage in dry regions is the stronger water harvesting ability of the knife point furrows over that caused by disc openers. The large furrows create a better chance of even crop emergence on small rains of 3-6 mm of rain only. Because of better weed control and increased water in the furrows from knife openers has resulted in our farmers maintaining the use of knife openers. This is despite strong exhortation from the USA and Brazilian speakers for us to change to disc openers.

Thank God for no-tillage and that we started doing it 20 years ago! No-till with smart agronomy has; softened our soils, captured more soil water, improved our time of sowing and weed control and has helped us to establish crops on soils that were too difficult to manage in the past. It has also opened our eyes to what else is possible and it has made the soil healthy.

### **How successful have cover crops (covers) been in WA or the world and why?**

Soil health is currently a global sustainable no-till farmer catch cry or phenomena. However, we must remember that it was no-till with herbicide use that led to our dramatic increase in productivity and improved soil health. So, are covers the next big thing for no-till farmers across the globe? There is much talk, too much talk in my view, about carbon and how storing it in the soil is what so many researchers have invested so much time into it.

Numerous trials and dozens of farmer paddock demonstrations have shown that covers offer my states farmers limited value and are mostly economically negative in our environment. Original work, some 15-20 years ago, with black oats, millet and sun hemp incurred significant costs to farmers with almost no benefit due to covers not improving our most limited cropping resource, in water. The exception is in areas where waterlogging is common, here a small benefit is possible.

While covers certainly offer significant benefits in Brasil and certain regions of the USA, they have not yet proved themselves beneficial in Canada, Australia and some parts of Argentina. Certainly poor crop rotations can lead to poor soil structure and weed and disease problems. However, a belief in cover crops, without clear economic goals, can torture farm profitability. There is a temptation for some no-till enthusiasts to believe and insist that simple formulas exist for soil health globally. This is too simplistic, as are some other global agricultural terms.

Even the highly respected "Conservation Agriculture", a term explaining; minimum soil disturbance, maximum residue retention and diverse crop rotations are challengeable. For example when one crop alone in monoculture might give the best long-term economic performance. For example; south of Edmonton, Alberta, Canada cropping with continuous canola has performed the best. In salty soils of Australia it is hard for other crops to better continuous barley. In the driest regions of the world, like on my farm, it is currently impossible to beat continuous wheat. In regions in Argentina it has been popular to grow continuous soya, but likely at some expense to soil structure and weed control, here's hoping a new semi-free market agriculture will help change that in the near future.

### **In dry regions of Australia cover crops use too much water**

For 6 months of the year, from November until April, pretty much all of southern Australia is too hot and too dry to grow an economical crop. Yet, there is a strong push through Victoria and South Australia, as you may have seen on Twitter, to encourage the USA approach with Covers. They say that Covers are essential to make healthy soils. There is the idea that unless the soil has something living in it 12 months of the year that the soils health will suffer. I dispute this! While Canadian soils in winter and Australian soils in summer can't grow anything, it does not mean that these soils are dead & that the soils' health is suffering. There's nothing wrong with having a rest!

Crop growth in all environments is limited by something! It can be too much or too little; water, sunlight and nutrients, or shallow soil or too much disease, pests, weeds, acidity, salinity, sodicity, water-logging, frost, temperature extremes, wind, or poor soil structure, bad timing or poor

agronomy. Smart farmers remove as many of the impediments as they can in a sensible and pragmatic manner with an eye on costs and returns for the amelioration management.

Every good farmer knows their own farm and soils and knows where the good soils are and usually understands why. Sands do not hold water and readily leach nutrients, clays do not let go of water which is tough on crops in drought years and yet they can store a lot of water in wet years.

For much of Western Australia, and in most years, we know that a lack of soil water and excessive heat during grain fill are the main reasons for crops not reaching their yield potential. In our environment the only time that covers could be grown is if we substitute a cash crop for a cover crop. Such a crop would need to be grown in winter and therefore the benefits would need to be greater than the cost of sacrificing a cash crop. No-one has yet shown a benefit for covers in my state, not even from the WANTFA trial results, as published by Dr Ken Flower.

I wish you every success in determining where cover crops will work in Argentina. I am confident that you will determine what is most profitable and sustainable on your wonderful farmlands.