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Panel Session: Conservation Agriculture: World Perspectives

ORAL ABSTRACTS

Conservation Agriculture: World Perspectives – Australia

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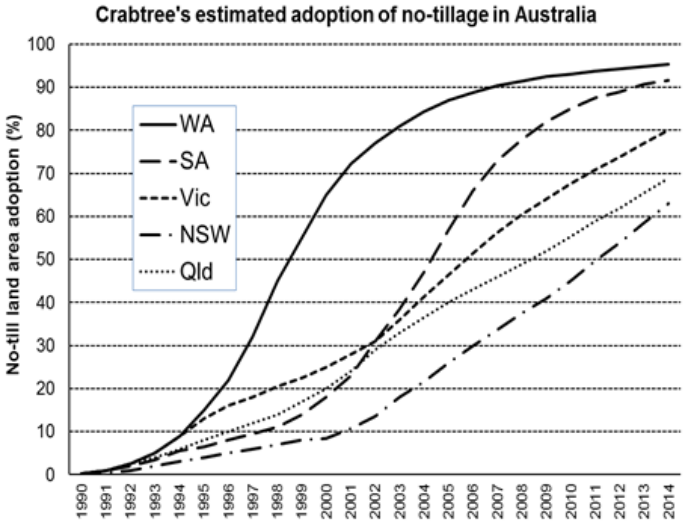
The adoption of no-tillage across Australia has been rapid and successful. The following graph from demonstrates the uptake across the main states. The grain growing environment in Australian is typically harsh with frequent droughts and very hot and dry summers.

Such environments make growing cover crops and sometimes alternative crops challenging. In the very dry regions the main crop grown is wheat with some canola and/or barley or triticale. While most Australian no-till farmers use knife openers (like most Canadian no-til farmers) perhaps 10-20% do use disc openers. Disc opener adoption varies with regions and is mostly influenced by residue levels, economics of diverse crop types and manageability of our most challenging weed in annual ryegrass.



The short and coolish winter growing conditions of 5-10C minimums and 17-27C maximums with the occasional frost and 10.5-11.5 hours of daylight length make our growing season quite long with low crop growing evaporation rates. Crops are mostly grown from May to October (inclusive) which can be 6 weeks longer in the wetter parts of our wheatbelt. Most long-term no-till farmers have removed sheep from their farms. This has been driven by better soil health where livestock have been excluded and the general lower profitability and complications of integrating livestock into the crop.

So how much Conservation Agriculture do we do in Australia? Well, most no-till farmers try and conserve most or all of their residue and most use the least amount of tillage that will work for their unique challenges and most have some level of sensible crop diversity. There are however some very dry regions where continuous wheat has been shown to be the most profitable and quiet sustainable. Some farmers have even added some chemical fallow into their rotation in order to survive the extended very dry string of recent years starting in the year 2000.

All Australian no-till farmer groups have adopted the definitions of tillage as outlined by myself in 1994, they include:

zero-tillage – disc seeding without soil throw (but note that some discs do throw soil)
no-tillage – knife point or disc seeding with 5–20% topsoil disturbance
direct drilling – one pass seeding with a full-cut or greater than 20% topsoil disturbance
reduced tillage – one pass of full soil disturbance prior to seeding
multiple tillage – two or more tillages before seeding (this replaces the term ‘conventional tillage’)

There is a very powerful incentive for farmers to adopt no-tillage farming. The economics of better timing and efficiencies, better plant/soil water relationships and superior weed control are the main drivers. Australian farmers do not have government intervention affecting their management and this ensures they perform or leave the industry.

There are some soils and challenges that do ensure that some land will receive a cultivation occasionally. The main areas are where soils become water repellent and require the physical mixing of clay into the surface to overcome this wax coating of sand. A small portion of the land is done each year and once it is ameliorated then it usually does not require another tillage event. Another soil challenge that may require tillage is subsoil acidity. On some of these high buffering capacity soils there is likely a sound argument for tillage to incorporate the lime to 30 cm depth.

There are very few remaining farmers in Western Australia where no-tillage is not adopted. Most of these farmers are likely those that will be retiring in a few years and find the change too challenging to make. But this is only a small area of the landscape.

No-till will remain above 95% adoption in Western Australia in the next five years. The biggest challenge in our environment will be sustainable herbicide resistance management. We have two weeds in annual ryegrass and wild radish that are prolific seed setters and have incredible ability to become resistance to all herbicides that are used against it. This has encouraged a reduction in residue levels through windrow burning and sometimes widespread paddock burning. This, I believe, has detracted from making faster soil health gains as it is the residue that drives the health of the soil in regards to physical, chemical and biological fertility.

The ability of cover crops to assist in weed management and economic improvements across Australian dryland farming is small, I believe. A one-size fits all approach, that some are promoting, is folly and demonstrates a lack of understanding of the diversity of agricultural systems around the globe. The view that glyphosate and fertilisers should be phased out is not helpful in the thrust for soil health improvements. A balanced, scientific and pragmatic view with a sound understanding of the holistic nature of agriculture is required in this very connected globe that we now find ourselves living in.

A greater appreciation of the benefits of biotechnology would help to manage more of the weed challenges we are experiencing. I do not believe that there has been the freedom to explore all the options that could be discovered with the strong degree of fear-mongering that continues in the EU and in Australia. My recent visit to the EU has shown just how foolish their policies been, which indeed have been promoting excessive tillage and horrendous and irreversible soil erosion.

Biodiversity Advocates for Conservation Agriculture

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Background

Situation of Conservation Agriculture in Europe is a paradox:

- excellent results in production, profit and environmental results by the best farmers with long term (more than ten years) experience of no-till systems following the criteria of the best practices recognized in leading CA geographies.
- Low adoption rate : approx.1 % of annual crops in France and even less in most of other EU countries.

The reasons for this low level of adoption despite more than 15 years of promotion by European associations are subject of discussions and interest from other geographies.

This situation impacts some other countries and continents in their policies for agriculture, as well as the attitude of players as global corporation.

Approach of the study

APAD with its partners has studied the reasons of this resistance to CA, with the interactive method of stakeholders dialog : establishing dialog with other farmers groups, partners of agriculture, scientists, experts, and civil society, from administration officers to politicians and journalists.

Once exposed to examples of CA farms and their benefits by farmers, or by CA experts in conferences, the targets are surveyed and give their feed back about their perception of CA: benefits / inconvenience.

Then the data are discussed with the farmers and operators in groups in the frame of our communication to advocate for CA.

First part of the results is an analysis of the reasons for this situation.

Second part is a training package repositioning the debate in terms more adapted to the needs for understanding and acceptance of CA benefits, focusing on description of biodiversity specific issues and opportunities.

Results

Part 1 : Analysis of the situation :

The first objections to CA from conventional farmers come from lack of knowledge, lack of references. Once exposed to the results, the convert into “would like to, but need support from advisors and civil society”.

Most of them do not believe it will be endorsed by citizens. And themselves react as ordinary citizens, i.e. submitting themselves to the general vision of what is “good agriculture”.

Thus the key resistances to adoption of CA are to be found in the mental attitudes of populations. Most of European, for historical and cultural reasons, and also under influence of ideological thinkers and NGO's, imagines agriculture as "natural".

It is coupled with the idea that "nature is good", and "old times were better".

Thus they reject technologies evaluated as "non natural" or "modern".

As an example they reject pesticides, but accept the plough and tillage as more natural than herbicide. Weeds and pests are not seen by citizens as real troubles to production, but only as excuses for big corporations to sell their compounds to farmers, see as victims. And farmers have difficulty to position themselves and cope with that.

Part 2 : Repositioning the debate with facts and realities, in a training package with three parts :

1. Reminding facts of what is nature and biodiversity in reality : not always good to human, necessary to be controlled in productive systems,
2. Positioning management of biodiversity by farmers in CA as a tool for sustainable farming systems,
3. Explaining benefits of high productive sustainable agriculture with CA to biodiversity :
    a. In anthropic agricultural ecosystems,
    b. In semi-natural areas managed by human in agricultural areas,
    c. For natural habitats dedicated to nature and wildlife preservation.

Applications and Implications for Conservation Agriculture

We have found that one of the key roots of resistance to CA adoption in Europe is the cultural and ideological vague concept of "natural agriculture" of citizens, but also of farming community. It is not representing the reality and is misleading.

It fosters wrong decisions and inefficient policies, as well from side as about management of wildlife and habitats. Private and public decisions must be based on facts and technical reality to produce real results.

This issue is growing in all developing world, where citizens in towns ignore realities of agriculture, to which they are less and less exposed.

There is a need for global community of CA to take care of this and engage efficient actions of advocacy towards citizens outside farming communities. A clear understanding of biodiversity facts enables to improve acceptance of CA benefits for a consistent strategy for biodiversity.

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Conservation Agriculture in Argentina: Development and Perspectives Agricultural Sustainable Production System

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For almost a century, particularly till the 80´s, very important political, economic, and technological limitations inhibited a progressive growth of the total Argentine agricultural output. The agricultural production was carried out in a non-sustainable way and hence agricultural development during these years was not free of cost in terms of soil and agro-ecosystem degradation.

In the 70´s local referents from the University and INTA (National Institute for Agricultural Technology) carried out some trials showing the efficient management of water resources and erosion control conducted on farmer fields under No Till. But the system was widely adopted only 15 years later, due to the big problem of soil erosion, increased operating costs and the emergence of herbicides at lower prices that allowed for more effective weed control compared to tillage technology. Also innovation in the design of new agricultural machinery was a challenge in those years and a country brand today.

At the beginning, local development was not the result of the research sponsored by government agencies or universities. The NT system occurred first in the farm then timidly moved to the scientific organizations to validate it. Was the result of farmers needs.

NT adoption involve science and innovation, generosity and openness to share experience and knowledge. Its momentum and subsequent dissemination were possible because of AAPRESID pioneers; their empowerment; and their determination to face difficulties, to produce information and to share it. It was a trial and error process, marked by successes and failures – a colaborative intelligence example.

In Argentina NT or CA system is adopted in response to the need to prevent soil loss by water and wind erosion, improve water infiltration into the soil and its storage.

The system was gradually adopted (Figure 1), but with the onset of the genetically modified crops, the expansion was quickly boosted. However, this is not a requirement for NT.

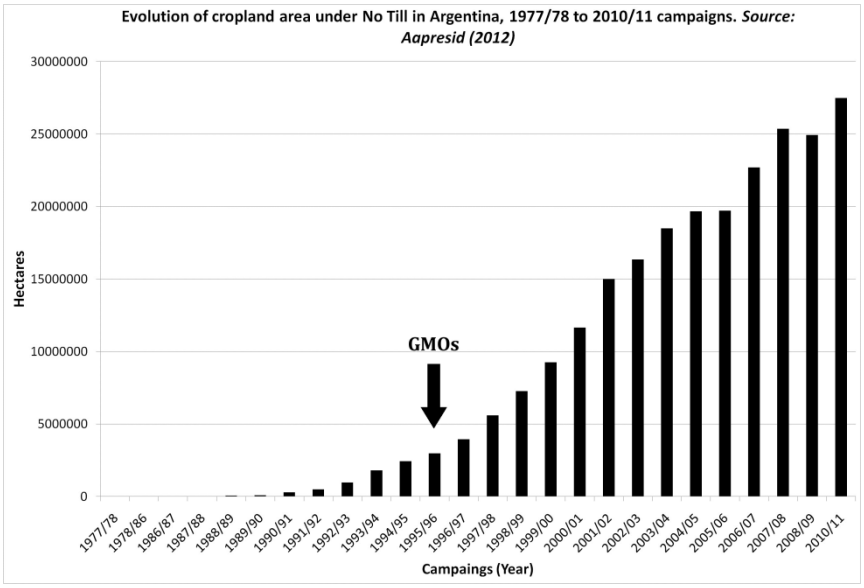

Figure 1 Evolution of NT area in Argentina in M ha (a) and percentage (b) during 1977-2011 period. Source: Aapresid 2012.

Production levels have more than tripled from around 35 million tons in 1992/1993 to around 105 million tons during the 2010/2011 cropping season. (Figure 2). Time and again, earlier projections have been surpassed by reality.

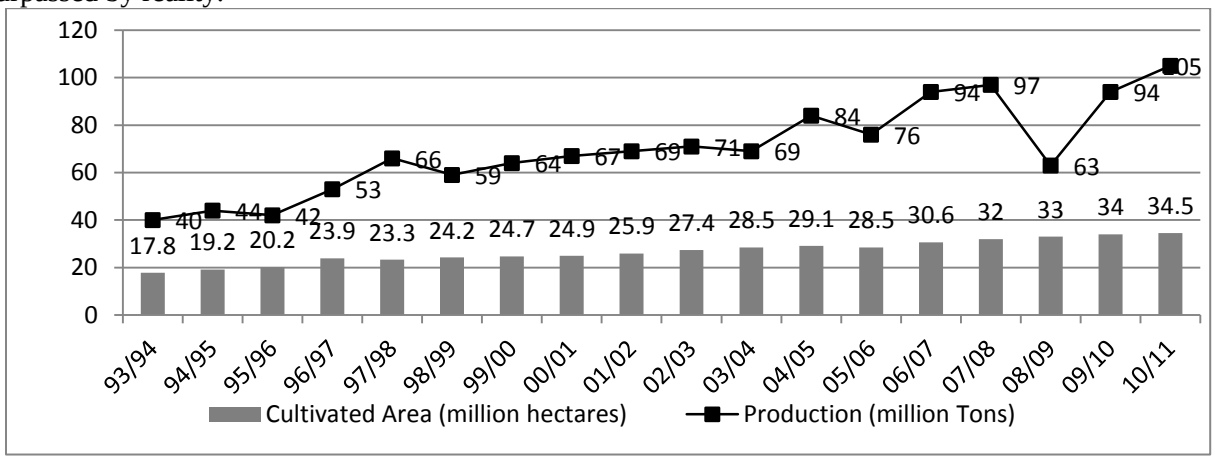

Figure 2 Evolution of Cultivated Area and Production in Argentina from 1993 to 2011. Source: Aapresid, 2012

Almost thirty years ago, Argentinean farmers have considered NT system as the opportunity to turn agriculture into a more productive and sustainable system. Nowadays, the same principles of that fusion between production and environment constitute the foundations of a global opportunity - to produce more, with less water, less soil erosion and less contamination.

For an efficient use of water under NT system, there are two key good agricultural practices namely: crop rotation adjusted to crop diversity and intensity based on the environment, and the associated nutritional management. Those practices enable maximize production according to the environmental potential, which is expected to result in better returns for the producers. Also with integrated management on insects, diseases and weeds, and responsible use of phytosanitaries and technologies in general.

Argentina has never had specific policies related to CA, except for a brief period (1999-2003), in Santa Fe province.

Conclusions

Argentina has a great potential to significantly increase its agricultural production during the next ten years and take full advantage of the opportunity provided by the ever increasing demand for food to sell its agricultural surpluses. A proper understanding by the political and urban sectors of this opportunity is an absolutely necessary condition to create an adequate socio-economic environment in which the rural sector can maximize its output. If we recall that only around 8% of the agricultural lands worldwide are cultivated utilizing the NT system or CA, we become aware that there is still a long way to go in the process of transforming the world's farming system. Some of the achievements are: 96% less soil erosion, 66% less fuel use, maintenance or improvement of the organic matter in soil, higher water use efficiency, increase in soil fertility, lower production costs, higher production estability and higher potential yield.

Transforming all the Pampas cropland into CA system –based in NT- would increase organic Carbon by 74 megatons, which means approximately twice the annual C emissions from the consumption of fossil fuels in Argentina (Alvarez and Steinbach, 2006).

Aapresid works with Programmes: Prospective, Agricultura CertificadaTM (Certified Agriculture), Chacras system, REM, Fundraising, Regional Groups and CLASSROOM Aapresid.

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From No-till to Ecologically Intensive Agriculture

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a : OSR seeded after tillage and treated with a full herbicide program ;
b : this OSR is showing an apparent intoxication from herbicides ;
c : OSR direct drilled on a neighbour field : companion crops and no herbicide or insecticide treatment;
d : Full program of companion crops that will fade progressively during the autumn and winter (buckwheat and lentil but could be also field bean, flax, vetch, camelina, red clover, lathyrus or fenugreek).

A good twenty years ago now, with the arrival of the CAP and plummeting grain prices, some pioneering farmers made the decision to minimise or even do away with soil cultivation in order to greatly reduce their production costs. At the time, taking steps in this direction required a lot of daring and a few utopian ideas, with no hindsight and little experience or adapted tools but the conviction, thanks to summary observations supported by discussion by a few enlightened scientists and agronomists, that this direction was a promising one. With the North and South American influence it was enough to reposition the soil as the central focus, to stop assaulting it mechanically and to maintain a protective cover of residues on the surface in order for the soil to

recover its natural functioning. In addition this position allowed erosion to be significantly reduced, water quality to be preserved and CO^2 emissions to be limited. While the theory is seductive, real and well-founded, the reality and the implementation were shown to be full of pitfalls. In spite of these difficulties, their conviction enabled the pioneers to progress and to secure their crop management sequences, often thanks to failures. Their pragmatism opened up the route along which more and more farmers could then venture and their ingenuity and sense of observation have allowed them today to design and implement efficient, very economical means of production.

During this period, we firstly moved from no-till or direct drilling to more precise, targeted interventions. Today we are no longer focused on doing away with interventions but, rather, we reason on the basis of soil and crop conditions. On this account, strip tilling is taking off in France. Many corn growers, but also sunflower and to a lesser extent sugar beet growers, have progressed thanks to this mixed approach with, today, a much larger variety of equipment and technical solutions available. The impact and the support are even greater in OSR cropping where strip tilling brings such strong crop establishment and is so successful that it is even swaying conventional farmers CA.

While fuel economy and that of mechanisation remain one of the main motivations, it opens the door towards systems that are overall a lot more energy efficient. With cover crops, legume mixtures, the savings in nitrogen - the biggest source of energy consumption in French agriculture - are more and more significant. Whether it will be from the resource or the pollution angle, energy could well become a central element and the economic outcomes of our agricultural companies are inexorably going to be more closely connected to the energy balance.

At the start, "CA refers to an agronomical approach of " Conserving the Soil", but with the benefit of hindsight, we have progressively moved to encompass broader environmental impacts. Already, in many cases, it is no longer a question of preserving soils but rather of bringing them back to life by protecting them but also by leaving an abundance and a variety of food on their surface. Farmers are progressively becoming a soil 'breeder' knowing that the healthier the soil is, the more he can safely withdraw mechanical tillage and also reduce a lot of other input. In addition and while our quest for more organic matter positions us as actors who, today, sequester more carbon than we emit, the pursuit of living soils has taken us from earthworms to functional biodiversity. Thus ground beetles have begun to manage slugs, syrphid flies and erigone spiders, encouraged by the cover crops, take care of aphids, and foxes, birds of prey and herons attempt to control voles. These are just a few examples that clearly show this fundamental change in perception and regard for living beings in and around farmland. Encouraging life and biological diversity brings us greatly beneficial returns that are difficult to quantify and of which we are still not aware enough. Even if it may seem more complicated at first glance, it is a lot more judicious and also economical to understand the natural relations and the functioning of the ecosystems in our fields in order to work with them rather than to remain locked in a strategy of struggle and conflict.

Cover crops, too often considered as a constraint, have been turned into efficient agronomic tools during this period. By leaving behind the nitrate trap crop approach, for the '**biomax**' approach with mixtures that easily surpass 5 to 6 tonnes of DM/ha to reach 10t of DM/ha, cover crops have

become more than just recyclers of nitrogen but real promoters of fertility. In this way they allow the physical and organic state of soils to be quickly put right, they nourish the soil's biological activity, they make weed control and the practice of direct drilling easier while developing self-fertility, especially when the mixtures contain legumes. Even though the approach is relatively well defined and mastered today, there still remain many interesting species to test and to confirm in order to continue to be guided towards the concept of the 'plant as an agronomic tool': http://agriculture-de- conservation.com/sites/ agriculture-de-conservation.com/IMG/pdf/covercrops-tcs.pdf .

Concerning fertilisation, after real concerns about nitrogen deficiency, we have developed the concept of self-fertility: restoring the organic status of soils also momentarily sequesters nitrogen in temperate and cool weather like us, mainly, but also many other elements. This phenomenon is all the more severe when cultivation is totally stopped and the initial fertility is limited. We have learned to get around this difficulty by anticipating input, occasional over-fertilisation, legumes in the cover crops, and rotation. With enough hindsight, however, the return on investment is very real and the savings are significant. In addition, precision fertiliser application can certainly allow us to progress in early crop support and to continue to gain in effectiveness with interesting additional benefits such as that of weed control.

In this regard, we have also lately moved from the need to control weeds to growing companion plants with the primary crop. It is definitely in this field that we have made the greatest progress in the past few years. While the adaptation of rotations with legumes and the double-break rotation system have provided concrete and reliable solutions in terms of weed control, crop combinations and the use of companion plants is a real revolution which is being developed and approved in OSR a crops where weeds were starting to become a major problem. Harvesting more with less tillage, less fertiliser and less pesticides is now a reality in the fields, a successful direction that illustrates and demonstrates all the potential of this new approach and that makes us want to continue our experimenting, our mixtures and our investigations even further. While we have largely found the right plant cocktails to combinewith OSR, a lot of other crops are still orphans and this indicates the size of the task but also the benefits that we expect to gain in this field in the near future. This success is a good illustration and is also leading the way towards what we like to call today EIA (Ecologicaly, Intensive Agriculture)

In view of all of these elements, we can be quite satisfied with the course and the progress that today make Conservation Agriculture a technical direction that is safe and within reach of a large number of farmers. It is because we have accepted to distance ourselves from the rather simplistic approaches of the start that we have been able to open ourselves up to other avenues of thought, sources of ideas and innovations. While No-Till has been and will remain for many a motivating entry point, the means of overturning an established way of thinking, it is no longer the central objective but a major element of the system, a tool enabling more efficient management methods to be put into place. As such, with this hindsight, and thanks to everyone's practical input and feedback, our direction has been well defined and greatly enriched, while moving progressively towards a more global approach of the quest for effectiveness based on the imitation of natural environments: a domain that is extremely rich and diversified by definition and where there is still a lot for us to learn in order to continue to progress towards greater efficiency.