Controlled Traffic Farming in Europe – Constraints and Opportunities

Tim Chamen

Controlled Traffic Farming (CTF Europe) Ltd, Bedfordshire, UK

INTRODUCTION

The aim of this paper is to highlight the contrasts between European and Australian conditions that have an impact on the design and uptake of controlled traffic farming systems. Necessarily, it is a broad brush approach because of the immense diversity of traditions, cultures and climates that prevail across the European continent.

Climate is a big factor in these contrasts as well as the relative position of the continents involved. Europe stretches from around 40–60 degrees north, whereas Australia sits between 12 and 43 degrees south. In equivalent terms the southern part of Europe starts at the north end of Tasmania and runs from there a further 20 degrees south. This means that our winters are colder and often wetter with soils slow to dry out and warm up in the spring.

BACKGROUND

European crops and farming systems

We have many crops in common with Australia, but with some notable differences such as limited amounts of cotton and no sugar cane. Primarily the cereal crops are similar, ranging from rye to maize and rice while oilseeds include canola, sunflower, soybeans and linseed, with peas (both dry and vining) and beans as the main pulses, plus onions, carrots, sugar beet and potatoes.

Traditionally, the mouldboard plough has been and continues to be used extensively, not only on lighter soils, but also on heavy clays. Legislation to stop straw burning in the early 1990s effectively curtailed significant moves towards minimum and no tillage. Elevated crop prices in 2007 also resulted in a significant re-investment in ploughs although the recent increase in fuel prices might mean that these are used less extensively than planned.

Crop yields can be relatively high compared with many parts of Australia, largely because of the more favourable rainfall conditions. Wheat for example can top 12 t/ha from 200-300 plants/m^2 sown in rows just 12.5 cm apart. Dealing with the associated straw, most of which is now chopped and spread, can be a challenge! To the casual observer, it might seem that the use of CTF is widespread (Fig. 1), but these are simply tramlines for chemical applications. Having first been introduced in the 1970s during crop sowing, it is now common practice but rarely sustained from one crop to the next.
Haulage of grain off fields is largely confined to modest-sized trailers that service the harvester and travel directly to the farmstead; chasers are relatively uncommon, but where they are used, grain is unloaded directly to trucks at the field entrance.

Many farms also have livestock enterprises where cash crops alternate with grass and maize grown for forage.

Farming infrastructure

Average farm size in the EU 15 was 19 ha in 2005, but some countries tend to have larger farms such as the UK and Denmark, with an average of 57 ha and the Czech Republic with an average of 84 ha. Universally however, field or paddock sizes are relatively small compared with Australia, as indicated in Fig 2, which is a snapshot of fields west of Paris.

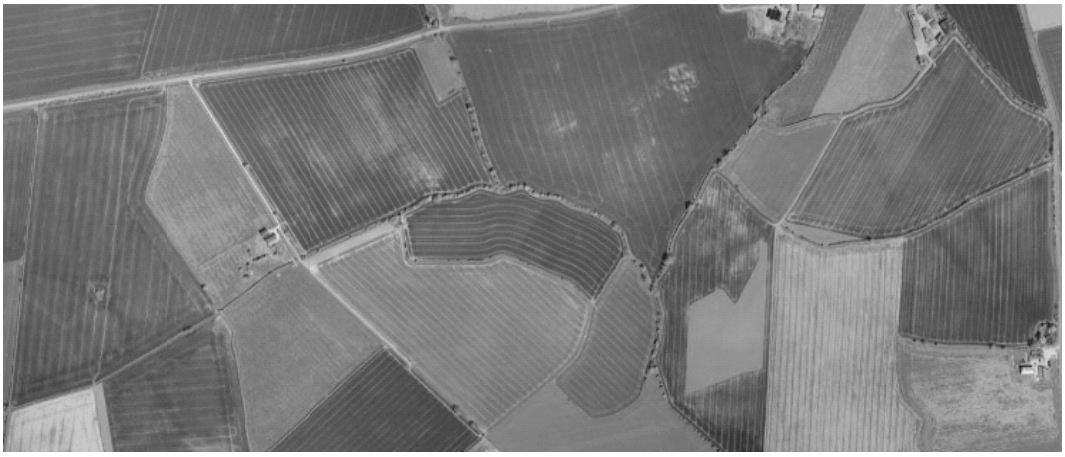

Figure 1. Temporary tramlines for chemical applications have been common across Europe since the 1970s. (Google Earth)

Figure 2. Typical shape and size of fields across Europe. The field pinpointed is around 14 ha and is at the larger end of average. (Google Earth)

Crucially, the area taken up by headlands is significant in these smaller fields and will therefore have an impact on the efficiency of any CTF system.

Fig. 3.Narrow roads constrain movement of wide vehicles

Farms are also commonly fragmented with blocks of fields separated by significant distances, often along narrow roads barely capable of accommodating one vehicle, let alone wide enough to allow passing (Fig. 3). It is also the case that across much of Europe, population density, even in rural areas, is significantly higher than in many of the farming areas of Australia. This together with narrow roads and strict legislation make wide equipment a considerable embarrassment. Germany for example requires a special dispensation for any vehicle measuring more than 2.55 m wide when used on the public road. Another inevitable consequence of smaller farms is smaller machinery, both in terms of width and power. However, this is not to say that there aren't a significant number of properties with several thousands of hectares.

DRIVING FORCES FOR AND AGAINST CTF IN EUROPE

Interest in CTF in Europe has been slow and has yet to reach critical mass. There are a number of reasons for this, but motivation for conversion is increasing and is reflected by a growing awareness and interest in CTF. Table 1 sets out some of the drivers for and against conversion to CTF, a number of which have been discussed in the preceding sections.

Table 1. Drivers for and against CTF adoption in Europe

Aspect	For CTF	Against CTF
Subsidies		✓
High crop yields	✓	✓
Crop price	✓	✓
High input costs	✓	
Tradition of mouldboard ploughing		✓
Small farms		✓
Small fields/paddocks	✓	✓
Livestock enterprises		✓
Relatively little contracting	✓	
Road legislation/population density		✓
Conservation of water	✓	
Drinking water quality	✓	
Soil erosion	✓	
Greenhouse gas emissions	✓	
Good field drainage	✓	

Subsidies in general seem to stifle innovation and cushion growers against commercial realities. For a period up until last year, some farmers were not experiencing profit above subsidy, but equally there were those growing exactly the same crops with very similar farming enterprises making a good profit. High crop yields and prices have both a positive and negative effect on CTF uptake. Research has shown that CTF increases yields on the non-trafficked area by 10-20% nearly 100% of the time, but with narrow gauge systems, the tracked area can be 30-40%, so even though these intermediate tracks are sown, the loss in yield might be significant. The truth is that we actually don't know yet whether yields in cropped tracks drop below conventional random traffic or not.

High input costs are a massive driver for CTF adoption because it is precision farming at its most efficient. All practitioners of CTF will know that it drives down input costs across practically all operations on the farm, particularly in terms of tillage, fuel and machinery investment. Unlike Australia however, the improved efficiency of tramline systems for chemical applications and "to and fro" working is unlikely to have a large impact, because it has already been practised for many years.

Mouldboard ploughing tends to preclude anyone wishing to adopt CTF, but there are still advantages where high value crops are grown and CTF is adopted "within season", known as seasonal CTF or SCTF. Organic farmers in the Netherlands and many other growers across Europe use this technique, but often refer to it as "bed farming" rather than SCTF.

As will be seen from the next section, satellite guidance is a highly effective enabling technology for CTF, but because CTF needs the highest grade of guidance, smaller farms presently find it difficult to justify on its economics. Smaller farms tend to have narrower equipment with a greater diversity of width and they often bale straw, which in most instances makes CTF even more difficult.

The reason that road legislation and infrastructure constrains CTF is that it is generally impractical to match all equipment to the track width of harvesters, most of which are close to 3 m. The last four aspects in the table above relate to the health of soils and this has recently become of major importance across Europe, largely because soils are becoming degraded, a great part of which is associated with excessive compaction.

SATELLITE GUIDANCE – AN ENABLING TECHNOLOGY

As stated by one of my CTF Europe colleagues recently, satellite guidance no longer has to be pushed into the market; it is now being pulled by customers. I envisage this pull increasing dramatically over the next few years for a number of reasons. Firstly, the cost of fuel and chemicals has approximately

doubled over the past 12 months and wastage through overlapping is no longer acceptable. Secondly, the cost of guidance systems is not only declining but they are increasing in capability and becoming more reliable and more accurate. Skilled labour is also increasingly difficult to secure and it will not be long before most of the in-field driving tasks will be managed by guidance systems.

Reliable delivery of guidance to individual farms is still a big factor in Europe, constrained partly by topography but also by features such as woodlands that are closely integrated into the farming landscape. Some countries, such as Denmark and the Netherlands do already have GPRS delivery of an RTK correction signal, but in the UK, it seems more likely that local RTK networks will prove popular. Delivery via the internet seems another possibility and no doubt this and other developments will move ahead rapidly.

PRACTICAL IMPLEMENTATION OF CTF

As we have seen, matching all wheel track widths to those of grain harvesters is largely impractical in Europe and we have therefore had to come up with viable alternatives. Influencing these alternatives are grain trailers that generally have a track width of just 1.8 m, although 2 m is now becoming more common. In practice we are seeing two principal systems for CTF adoption in grain production, namely OutTrac and TwinTrac. OutTrac, as the name implies, has the harvester travelling "outwith" the narrower track of all the other vehicles, as indicated in Fig 4.

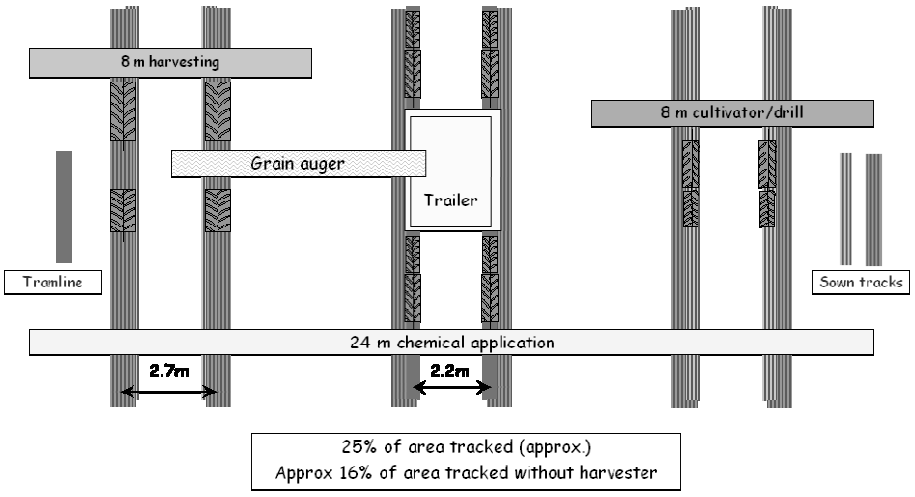

Figure 4. An OutTrac CTF system that uses two track widths centred on each other but with a common implement width

TwinTrac is a clever idea suggested by a UK farmer that caters for two track widths but doesn't enlarge on the tracked area. Fig 5 shows the basis of the system but where this is being used, implement widths tend to be non-integer sizes and the great advantage of the system is that it can accommodate a wide range of options. Other systems and combinations have been identified and so far no two farms have adopted exactly the same system.

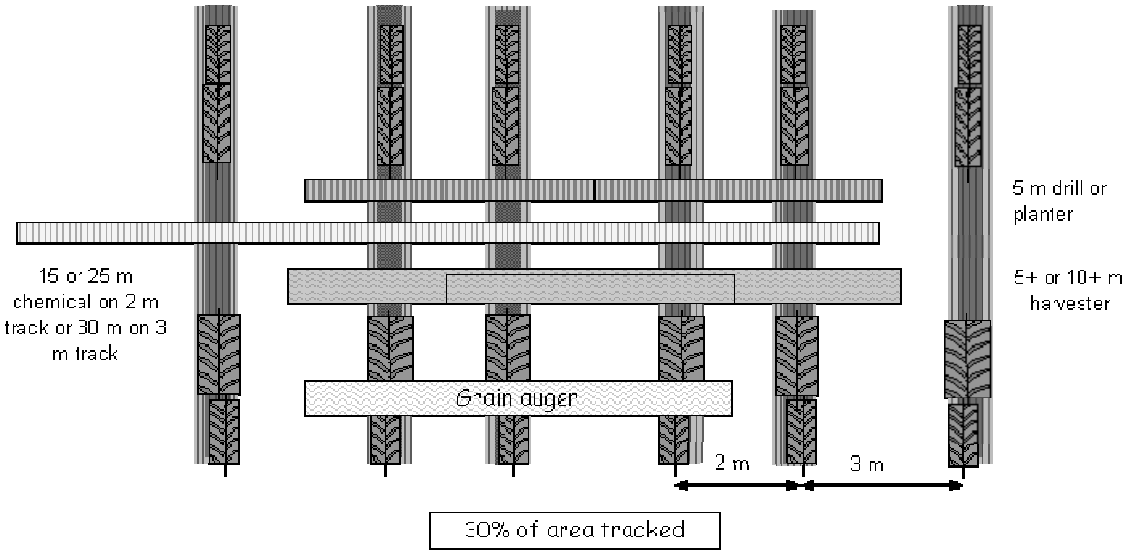

Figure 5. TwinTrac CTF system in which the narrower tracks straddle the outer tracks of adjacent passes of the harvester. Implement width is the addition of the two track widths

CTF is also being used for forage crops, particularly in Denmark. Here systems as wide as 14 m have been adopted to improve both the annual production of grass and longevity of the sward. Traditional management leads to a reduction in grass productivity year on year meaning that a new start is often needed by year four. Loads on these soils are high with slurry injection being a core activity, including during the growing season (Fig. 6).

Figure 6. 14 m wide slurry injection system working on a controlled traffic layout

As mentioned earlier, both Dutch and Danish growers have adopted SCTF systems for high value crops, but they recognise the shortcomings of these and are keenly working to integrate harvesting into the system.

Most CTF farmers have now accepted that they need RTK satellite guidance because of the greater accuracy and more importantly, the repeatable positioning that comes with it. There is a tendency to associate CTF with no-till and this is not altogether helpful because no-till has yet to become widely adopted. To some extent this revolves around the high residue levels but also because of an association between the negative impact of compaction and no-till systems. No-till land tends to experience a loss in yield over the first few years but this will almost certainly be absent if CTF is adopted simultaneously. The difference between three years of no-till on randomly trafficked clay soil compared with the same period under CTF was plainly illustrated in December 2007. Under very moist conditions on the trafficked treatment it was impossible to prise out soil with a fork inserted to around 30 cm depth, despite working around all four sides of the area. In stark contrast, soil in the CTF field alongside could easily be raised with just one insertion of the fork. This, as I'm sure you

will all know, reflects the essence of CTF – healthy soils promoting healthy crops that return a healthy and sustainable farm profit.

THE FUTURE FOR CTF IN EUROPE

The uptake of CTF in Europe is I believe, likely to be somewhat slower than it has been in Australia, but I would like to be proved wrong! The reasons for this slower uptake are:

- Continuation of subsidies until at least 2013
- Farm sizes and road infrastructure constraining the flexibility of CTF systems
- Opportunity cropping based on water supply is uncommon in Europe
- A widespread tradition of mouldboard ploughing
- Language barriers and wide contrasts in traditions and farming systems
- Conservatism – not wanting to be the first to try out something new

Aspects that might alter this prediction include:

- Further significant improvements in guidance systems and reduction in costs
- Further increases in production costs, particularly fuel and fertilizers
- Incentives for growers to adopt more environmentally friendly production techniques.

As far as the positive impact of CTF is concerned, I have no doubt that it will be widespread, significant and sustainable. Agritechnica last November in Hanover reflected the continuing rise in enormity of machines with little regard for the soils upon which they work. Videos tended to represent soil as an inconvenience, as dirt that had to be beaten into submission rather than nurtured as our primary asset. Increasingly there is recognition that this cannot continue and some are seeing CTF as a solution that constrains us rather little compared with other less effective approaches to soil care.

KNOCK-ON BENEFITS FOR CTF IN AUSTRALIA

The most obvious benefit is the increasing demand for guidance systems that will generate more competitive pricing while improving capability and range of uses. The other main benefit is in the development of CTF systems for a wider range of crops, particularly those of a high value and bulky nature, such as potatoes, onions, carrots, celery and spinach. These are the real challenge for CTF and I believe European farmers as well as applied research activity in Tasmania will be leading the way. And dare I say it, based on grower interest, perhaps going down the route of gantry systems to create the ultimate in CTF efficiency and flexibility (Fig. 7)!

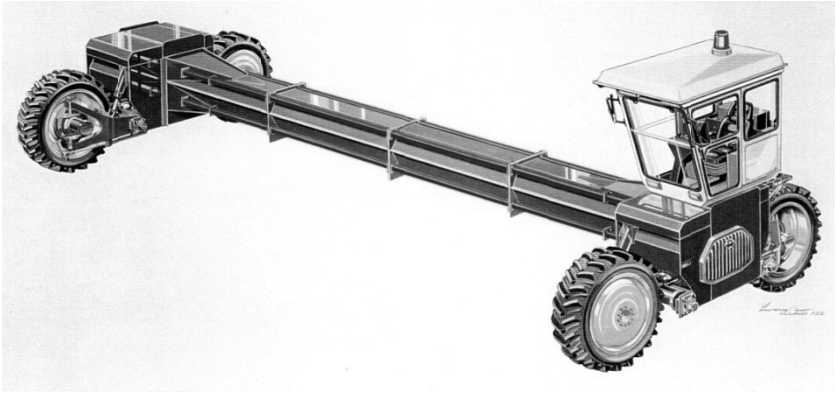

Figure 7. The gantry tractor is not new but could it have a major role to play in CTF?