

Conservation Agriculture in Europe

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Abstract

The adoption of Conservation Agriculture (CA) in Europe varies according to the ecological regions of the continent. Although Europe is behind other countries in adoption of CA, the indicators for future progress are encouraging. The area where CA is applied is growing rapidly because of increasing environmental awareness, including soil protection, and because of the need to reduce production costs. The European Conservation Agriculture Federation (ECAAF) plays an important role in the adoption and dissemination of CA practices, and in discussions involving CA and the EU Common Agricultural Policy (CAP) reform.

Yield performance and stability, operating costs, environmental policies and programs of the Common Agricultural Policy (CAP), and climate change will likely be the major driving forces defining the direction and for the extension of CA in Europe. The role of agriculture in climate change mitigation in the EU is discussed in the paper.

Key Words: Conservation Agriculture, Reduced tillage, No tillage, Climate change mitigation, CAP reform

1 Introduction

Conservation Agriculture (CA) is practised on over 125 Mha around the world, covering approximately 10% of the global arable land surface. This compares to only 45 Mha in 2004 (Friedrich et al., 2012). The largest and most rapid expansion has been in North and South America, Australia/New Zealand, and some parts of Africa. The estimated annual adoption rate of CA has approximated 7 Mha yr⁻¹ during the last ten years (Kassam et al., 2014, this issue).

Compared to this, the adoption and extension of CA in Europe has not been as rapid nor as extensive. According to Eurostat (2010), CA is practiced on 22.7 Mha, representing 25.8% of arable land in Europe. There has been intensive research on various aspects of no tillage (NT)³ and reduced tillage (RT) in Europe between 1960 and 1990 (Soane and Ball, 1998), and these have been reviewed by various authors (Cannel, 1985; Soane and Ball, 1998; Rasmussen, 1999; Tebrugge and Daring, 1999; Holland, 2004; Deumlich et al., 2006). Recently, Soane et al. (2012) published a comprehensive review of Conservation Agriculture in Europe.

Soil erosion is a major problem throughout the world, and also in Europe, particularly in the semi-arid regions. Soil protection against erosion and degradation is an important aspect, because water erosion occurs on 12% of the total European land area and wind erosion on 4% (Oldeman et al., 1991). However, soil erosion risk varies according to the different ecological regions in Europe, with the northern, cool, temperate regions having the lowest risks, and the semi-arid Mediterranean regions having the highest. Soil erosion is serious on about 25 Mha in the Mediterranean region (De Ploey et al., 1991).

The reasons for adoption of CA in Europe have been described by Soane et al. (2012), among others. CA has application in regions where mitigation of soil erosion and land degradation are important objectives, but

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³ No-tillage and zero-tillage are used interchangeably in this paper.

also in those parts of Europe where retention of soil moisture is important to ensure economically viable agricultural production. In the latter locations, mostly the semi-arid and Mediterranean regions, retaining water in the soil provides some degree of drought proofing and some level of economically acceptable yields even during dry periods. On the other hand, CA is a useful, complementary, land management strategy for reducing surface runoff and surface water pollution, as well as mitigating the severity of flooding, mostly in northern regions of Europe with predominantly cool and wet climates and extended, long lasting, low intensity rainfall.

Adoption of CA in Europe is predicated more on improving net returns, through reduced operating, labor, and input costs, and on enhancing environmental benefits, than on mitigating soil erosion. This is typical of countries such as Finland and Germany where CA practices are spreading very quickly. Although benefits for the soil and for the environment are important issues, the introduction of CA practices in Europe has been driven mainly by economic considerations (Lahmar, 2008).

The average rate of soil loss in Europe has been estimated at about $17 \text{ mg ha}^{-1} \text{ yr}^{-1}$, which exceeds the estimated rate of natural soil formation, about $1 \text{ mg ha}^{-1} \text{ yr}^{-1}$ (Troeh and Thompson, 1993). However, comparison of conventional and CA practices show that applying CA generally keeps the rate of soil loss under that of soil formation (Bádonyi et al., 2008; Kertész et al., 2011), thus enhancing the long term sustainability of the system. Also, besides providing protection against water and wind erosion, CA improves soil health and resilience by maintaining good soil structure, enhancing soil moisture storage, enriching soil organic matter, improving the habitat for soil micro and meso-fauna, and enhancing soil biodiversity.

The European Conservation Agriculture Federation (ECAAF) was founded in 1999 with the objective to adopt CA in its member countries, and to integrate CA as the basic principle in mainstream agriculture in Europe and the EU member states (ECAAF, 2005). According to ECAAF (2005), Europe lags other countries in adoption of CA because: 1) there is less need to take risks in Europe because the cost reductions are not as important as elsewhere; 2) lack of technology for European conditions; 3) lack of appropriate technology transfer; 4) lack of institutional support. These conditions held true until early in the 21st century, but since then new machinery and technology have become available, and adoption has accelerated as a consequence. Also, enhanced institutional support became available from the EU authorities/institutions, while reduction of costs became considerably more important. ECAAF took part in the discussion and development of the EU Soil Thematic Strategy.

2 Distribution of Conservation Agriculture (CA) in Europe

Figures 1 and 2 show the share and location of total arable land under CA and NT (no till) in Europe in 2010 (adoption is shown for the 27 EU countries (EU-27), as well as for Norway, Switzerland, Iceland, and Montenegro). The countries with the highest proportion of CA and NT are Cyprus (62.1%), Bulgaria (58.0%), Germany (41.1%), U.K. (39.2%), Finland (38.7%), France and Switzerland (36.4%), Czech Republic (34.8%), and Luxemburg (31.0%). The EU-27 country average is 26% (Eurostat, 2010). The countries are distributed among contrasting eco-regions, reflecting different driving forces for adoption of CA, as well as varying government policies and promotion.

The evolution and adoption of CA in Europe has not been consistent. According to Basch (2012), the percentage of CA/land area in Switzerland in 2005 was 43%, but declined to 36.4% in 2012; in France, the area increased from 17% to 36.4% during this period; in Germany the area increased from 23% to 41.1%; and in the U.K. the area increased from 31% to 39.2%. In general, however, the adoption of CA in Europe has been increasing continuously. It is interesting to note that the increase in area of CA in Spain, Portugal and Italy under perennial crops (fruits, vineyards and olive plantations) has exceeded the adoption rate in annual crops.

The geography and cultures in Europe are highly variable, and consequently there has been considerable variation in types of agriculture and interest in applying CA practises. The UK, Switzerland, and Scandinavia were the pioneers for CA development and adoption, and increasingly overtime, farmers changed from conventional tillage to CA. By the end of the 1970s in the UK, 8%–10% of the winter cereals was produced under no tillage or reduced tillage (Soane and Ball, 1998). However, because of unexpected problems of crop residue management and weed management, these often reverted back to mouldboard ploughing. A similar scenario occurred in Scandinavia between the 1970s and the late 1990s (Rasmussen, 1999).

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