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The transformation of agriculture in Brazil through development and adoption of Zero Tillage Conservation Agriculture

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Abstract

The soil conservation movement in Brazil has been a major driving force in the continuing search for agricultural farming systems that are more sustainable than what we have today, particularly in tropical and subtropical areas. The development and adoption of Zero Tillage Conservation Agriculture (ZT/CA) was the key to the success of this movement, generating agricultural, environmental, and societal benefits.

Adoption of the ZT/CA philosophy and technologies is currently practiced on more than 50% of the annual crop area. This is due to the work and innovations of pioneering farmers, agronomists, researchers, and consultants that were and are involved in these efforts. This extensive adoption of ZT/CA occurred after many unsuccessful efforts to mitigate against the devastating effects of soil erosion that were threatening the entire agricultural industry in Brazil. Technicians and farmers realized that erosion control required continual cover of the soil to guard against the torrential rain storms common to these regions. This triggered the efforts of soil conservation pioneers at different points in time and regions of Brazil.

In southern Brazil, Herbert Bartz, watched his topsoil eroding away in torrents of runoff. This set him thinking and searching for alternatives, resulting in his adoption of ZT/CA farming in 1972. Ten years later in Brazil's centre-western savannah (Cerrado biome), farmers, researchers, crop consultants and agro-industry initiated efforts to expand cultivation into the very difficult production region of the Cerrados. This was successfully achieved through the pioneering work of agronomist John Landers, bringing experience from the ZT/CA farmer association networks in the south.

These were the turning points in the sustainable development of annual crop farming in Brazil. Today, society recognizes the role of these pioneers as key to achieving social, economic and environmental sustainability. ZT/CA reversed the historically accelerating degradation of soil organic matter and soil structure by abandoning conventional tillage, thus improving soil physical and chemical characteristics. This was achieved by promoting cover cropping and permanent soil cover with crop residues, crop rotations, and complementary, environmentally suitable soil management technologies.

Key Words: Soil conservation, Zero tillage, Conservation agriculture, Sustainable soil management, Soil organic matter

1 Introduction

The soil conservation initiative in Brazil is closely linked with continuing efforts to develop agricultural systems that are more sustainable, profitable, and environmentally friendly than those of today. Soil conservation was the foundation for these efforts, with zero tillage as a central pillar.

The adoption of Zero Tillage Conservation Agriculture (ZT/CA) in Brazil has been based on principles of sustainability, with social, economic and environmental dimensions. It integrates the objectives of high productivity, low consumption of fossil fuels, increased carbon sequestration, and mitigation of water and wind erosion. The

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success of these efforts is illustrated by the fact that these procedures are used in over 50% of the area cropped for annual crops. It is also illustrated by the major shift away from traditional tillage to more environmentally friendly practices. This has revolutionized the entire production chain in tropical and subtropical regions of Brazil.

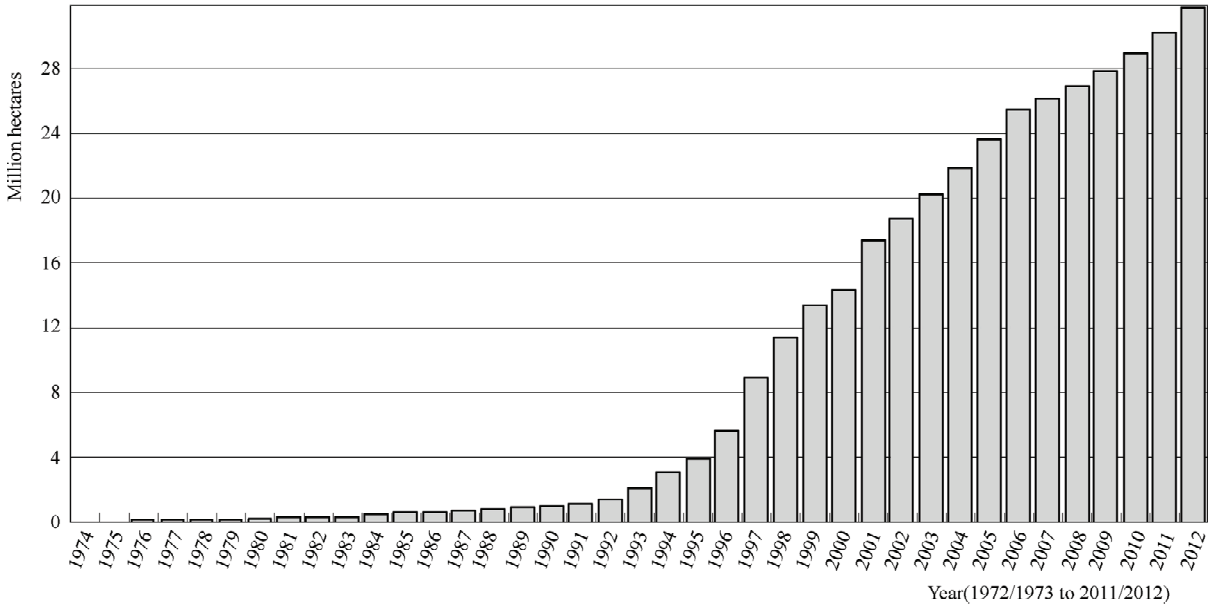

Fig. 1 Evolution of ZT/CA management systems in Brazil (based on FEBRAPDP, 2013)

This did not happen easily or quickly. As in most other countries, agriculture in Brazil was initiated using traditional inversion tillage based on experience from temperate regions in Europe. The adoption of management systems not adapted to the specific pedoclimatic conditions, the devastation of soil erosion, and market pressure from poor commodity prices promoted expansion of these technologies, particularly in areas highly vulnerable to erosion, as shown in Fig. 2 (Ramalho-Filho et al., 2009).

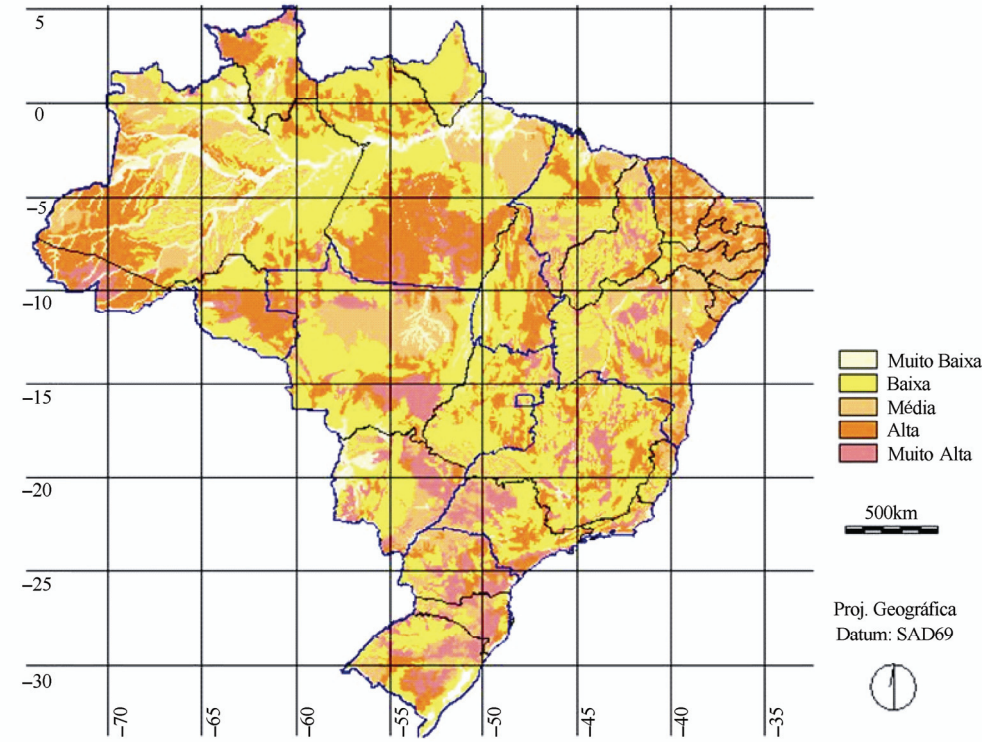

Fig.2 Soil vulnerability to water erosion in Brazil (based on Hernani et al., 2002)

(The legend represents five levels of vulnerability: Muito Baixa is Very Low; Baixa is Low; Media is Average; Alta is High; Muito Alta is Very High.)