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## **Contributions of Zero Tillage to Sustainable Soil Management - Brazilian Experiences in Adopting ZT/CA and Integrated Systems**

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From 1972, Zero Tillage adoption in Brazil has had profound effects on Brazilian agriculture's performance; agricultural exports were 41% of the 2017 total. Brazil's ZT area is now estimated at 35 million hectares, occupying 55% of crop area; all sectors of agribusiness and agricultural research/extension have engaged with farmers and civil society to promote this technology, which reduced erosion to 11% and runoff to 20% of plough-based systems. ZT is totally compatible with other advances in technology, such as: biological controls, controlled traffic, precision agriculture and inclusion of cover crops in the rotation. Farmer-based initiatives were essential to early adoption, mainly via municipal-level Friends of the Land Clubs. Initially, the reasons for adoption were erosion control and lower direct costs, including halving diesel consumption plus reduced machinery investment costs in the medium term. Planter and drill designs improved continually to export quality, while shorter cycle cultivars allowed second crop maize to be planted after soybeans on approximately half of the tropical soybean area, while cover crop options have greatly diversified and improved in quality. In time, secondary benefits appeared: higher biological activity improves nutrient economy as does higher soil organic matter (also raising soil moisture-holding capacity), better internal drainage increases the planting window, reduced water use in irrigation, while integration of crops and livestock improves returns to both. Social benefits extend beyond the advances in technology and the farm gate, such as: engendering greater farmer respect for the environment and off-farm impacts: land use intensification revitalising degraded pastures (mitigating the demand to clear new land), reduction of silting in reservoirs and waterways, mitigation of flood peaks, enhanced aquifer recharge, improved water supplies for urban populations, lower global warming via better GHG balance and albedo reflection from straw, lower food prices, increased participation of agricultural exports in the GDP and virtual extinction of basic food imports, besides eliminating the dust clouds during conventional soil preparation. Policy actions were needed: to accept ZT as eligible for subsidised credit, bank insurance with rural credit was reduced by one percentage point (reduced erosion risk) and, since 2010, the Low Carbon Emission Agriculture Program has contributed with 3,0mi. ha of ZT adoption and 0,5 mi ha of integrated crop-livestock systems. Although repeated crop successions, and not pluri-annual rotations are the rule, Brazilian farmers and researchers now lead the world in sustainable tropical and sub-tropical agriculture.



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