

## **CONSERVATION AGRICULTURE AND PRODUCTIVITY: A PANEL ANALYSIS OF NORTH AND SOUTH AMERICA**

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Abstract:

Food production and agricultural systems worldwide are under pressure with increasing concerns about food security in an era of increasing global population, changes in climate patterns, rising energy prices and declining soil fertility. Hunger, poverty and environmental damage associated with agriculture are still contemporary issues despite all the international efforts and recent progresses. There is a need to engage in agricultural intensification practices that are capable of addressing simultaneously food security, land degradation, climate change and preserving ecosystem functions and services.

Conservation Agriculture may provide a new paradigm for the sustainable intensification in agro-ecosystem. The approach aims at enhancing productivity, optimal soil health and ecosystems services by relying on minimum mechanical soil disturbance and direct seeding, permanent organic soil cover and crop diversification. Empirical evidence worldwide supports the agronomic, economic, social and environmental benefits of such practices.

The present article aims at estimating the impact of conservation agriculture on agricultural productivity by looking at the effects on both the average yield and its variance. We use data from Argentina, Brazil, Canada, Paraguay and United States, which account for 80% of the world area of Conservation Agriculture and close to 8.5% of the world arable land, and construct panel data models representing the production of cereals, cotton, soybean and sunflower over the period 1970-2008.

Our preliminary results illustrate that an increase in the area under conservation agriculture has significant positive effects on crops yield. This result is in line with the existing literature. One possible explanation for the positive effect of conservation agriculture on productivity may relate to its effect on soil organic content and the consequent improvement in the interactions between soil physical, chemical, biological and hydrological components. Furthermore, an increase in the relative area under Conservation Agriculture does not lead to any significant increase in the yield variance. This finding seems to suggest that the positive yield effects of conservation agriculture do not occur at the expenses of reduced resilience in the agro-ecosystem.

Finally our results also suggest that both the increased use of fertilizer and the increase in the area of genetically modified crops have are associated with an increase in the yield variance.

Conservation Agriculture is a mature technology that can be implemented worldwide in all types of farm structures and agricultural systems, capable of sustaining higher crop yield while at the same time restoring soil fertility and soil structure. Its adoption may play an important role in achieving the sustainable intensification needed to face the aforementioned contemporary challenges.