

# **Innovative Approach to Address Challenges and Opportunities to Conservation Agriculture Adoption in Brazilian Agricultural Frontier**

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## **Background**

Brazilian agriculture is facing another expansion cycle to the Cerrado region, more specific in the Northeast. The first agriculture expansion cycle to the Midwest was in seventies encouraged and developed by Brazilian Government with farmers from southern and southeast Brazil, which were traditional small farmers with some experience, low budget and a remarkable determination. All of these efforts after 20 years resulted in an outstanding development of a part of the country with economy based on agribusiness (soybean, corn, cotton, livestock, poultry, swine, etc.). In late nineties, another cycle initiated in the Cerrado Northeastern region known as MATOPIBA (acronyms of Maranhão, Tocantins, Piauí, and Bahia states). Bahia and Maranhão were more pronounced and became very strong over time. Recently, basically in the last 5 years Tocantins and Piauí states started to increase agricultural production in high rates, reaching in Tocantins state a 30% increase of crop area per year and 34 % increase of total grain production per year and soybean is the major crop. Most of technologies developed in other Cerrado regions are not well adapted to MATOPIBA and a technology transfer is necessary to address conservation agriculture principles to farmers, agronomists, consultants and extension agents.

## **Results**

We developed continuous improvement of the methodology of technology transference (TT) through modular training program for extension agents; coordination of a network with more than 100 extension agents, scientists and consultants in Tocantins State; implementation of 41 technological reference properties that adopted conservation agriculture based on low carbon emission; creation and maintenance of an internet blog with information related to project actions and technical support material (<http://abc-to.blogspot.com.br/>); presentation of 6 field days with focus on conservation agriculture for more than 1000 people; participation on 40 lectures to farmers and advisors; accomplishment of 168 hours of classes during the modular capacity building events; and finally the strengthening of the rural extension and research institutions due the approval of Agenda between the Ministry of Agriculture and the state rural extension service, a Cooperation Agreement between Ministry of Agriculture and Embrapa and the publication of the state bill establishing the State Plan for Mitigation and Adaptation to Climate Change for the Consolidation of an Economy of Low Carbon Emissions in Agriculture.

## **Applications and Implications for Conservation Agriculture**

Most of the recent agricultural area were converted from degraded pasture; however, native Cerrado still been converted into agriculture. According to this scenario, with considerable farmers and companies introducing more land into agricultural production, the challenge is to increase conservation agriculture-based cropping systems adoption by farmers and agronomists. MATOPIBA have been facing great challenges to conservation agriculture adoption due the lack of technologies developed or adapted to regional conditions, which is very warm, low altitude, well-defined dry season (7 months per year), and high daily and nightly temperatures. Rain season is high intensity and varying among locations from 1300 to 2000 mm in 5 months. The agricultural development proposed to this region, must be conservation agriculture-based, and adopting crop and soil management potential resilient to climate change. The experience acquired in the first cycle of Cerrado expansion is important to avoid some inadequate technologies applied in crop production, and to develop a more sustainable crop production. Nowadays, the access to knowledge compared to seventies or even nineties, when the internet and other technologies were incipient in Brazil, make agriculture more dynamic and is necessary very careful in the application of technologies that are not validated to regional conditions.

## Experimental approach

In order to begin the research program and also technology transfer to the region, the research team developed an assessment of the agricultural practices used in crop production (Borghini et al., 2012). Results from this report were the baseline about agricultural and livestock systems characterization in the state, and the results were used to support research and agrotechnology transfer to address problems farmers were facing in crop production. Additionally, we developed an approach to share knowledge and enhance practical and theoretical capacity of scientists, agronomists and consultants – which were capable of to transfer low carbon emissions technologies such as no till system, degraded pastures recovery and integrated crop-livestock-forestry systems. The approach was based on Training & Visit (Bennor & Harrison, 1977; Domit, 2007), Farmer Field School Approach (Braun & Duveskog, 2008; Sustainet EA, 2010), Reference Network (Miranda & Doliveira, 2005) and On Farm Approach (USA, 2004), aiming to allow the agronomist a perspective to look at a whole-farm instead of field-scale or one specific agricultural or livestock system and then make a well-designed plan with the farmer to adopt conservation agriculture practices (short and long term). Agronomists enrolled in the training program are encouraged to apply the knowledge learned during the training at a whole-farm level planning and making decisions and interventions in the crop/livestock production systems on their costumers based on several discussions with scientists, growers and others agronomists participants in the training program. All of the interventions in the crop/livestock production systems are intended to enhance the conservation agriculture adoption by farmers mainly those that are low carbon emission based.

## Results and Discussion

The results obtained will help Brazil a volunteer compromise to reduce on 36.1 to 38.9% the GHG emission until 2020 established during the COP 15. Brazil create the "Sectorial Plan for Mitigation and Adaptation to Climate Change for the Consolidation of an Economy of Low Carbon Emissions in Agriculture" – ABC Plan. This plan has the objective of organize and plan the actions to be performed for the adoption of sustainable production, selected with the objective to achieve the commitment to reduce GHG emissions by the agricultural sector (MAPA, 2012). The ABC Plan is composed of seven programs: 1. Recovery of degraded pastures; 2. Integrated crop-livestock-forestry systems (ICLS); 3. System No-till; 4. Biological nitrogen fixation (BNF); 5. Forestry; 6. Animal waste treatment and 7. Adaptation to climate change. As member of Plan ABC National Executive Commission, the Brazilian Agricultural Research Corporation (Embrapa) has the role of coordination of the actions on research and development (R&D) and technology transference (TT) in national tactical level.

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