

Measuring the Impacts of Conservation Tillage (CT) on Household Income and Wheat Consumption: A Syrian Case

Tamer El-Shater, Yigezu A. Yigezu*, Amin Mugeru

*Corresponding author: Agricultural Economist, Social, Economic and Policy Research Program (SEPRP), International Center for Agricultural Research in the Dry Areas (ICARDA), P.O.Box 950764 Amman 11195, Jordan, Tel: +962-6-553-1196 , Fax: +962-6-5590-3120, E-Mail: y.yigezu@cgiar.org

Conservation agriculture (CA) which involves many different conservation measures and sustainable soil and water management practices including zero tillage (ZT), early sowing, reduced seeding rates, crop rotations, and residue retention is believed to be one of the promising technologies that can provide a panacea for the longstanding agricultural problems in the drylands of the West Asia region. However, CA is often looked upon with high degree of skepticism mainly due to lack of information and evidence particularly on its profitability relative to traditional tillage and other agronomic practices (Belloum, 2007).

ZT conserves soil moisture and reduces fuel, labour, and machinery costs (Ribera et al., 2004). In addition, a reduction in wind and water erosion provides significant environmental benefits. Apart from moisture conservation and cost savings, ZT can often lead to higher yields and increased net returns with reduced yield and income variability which is particularly important in dry areas. As in many high income countries, CA can also lead to possible benefits to smallholder farmers, consumers, and rural and national economies in low and middle income countries in Asia and Africa, especially in dry regions (ICARDA, 2012). With this premise, a number of efforts have been made by the governments of Syria and Iraq to introduce ZT and few other components of CA using local resources and funding from international development organizations including the Arab Agency for Agricultural International Development (AAID), Arab Center for Studies of Arid Zones (ACSAD) and ACIAR-AusAID. Given its fairly recent introduction, adoption and impacts of ZT in Iraq are relatively low. However, in Syria, given the awareness created through earlier efforts by the government through funds from AAID and ACSAD, ZT has been well received by relatively larger number of farmers in a fairly short time when it was introduced through the ACIAR-AusAID funded project in early 2005. The success of the ACIAR-AusAID project in enhancing the adoption of ZT in Syria may be attributed mainly to its ability to: 1) facilitate the local production of the much needed ZT seeders at affordable prices and 2) be flexible in terms of letting demonstration farmers to choose the adoption of the ZT technology individually or in combination with the other components of the CA technology package. Survey results from Syria show that adoption is taking place rapidly. Moreover, the benefits of CT for increasing soil fertility and soil health have been extensively documented in the literature. However, it remains to be established that CA in general and ZT in particular are attractive especially in mixed crop-livestock production systems with clear social, economic and environmental benefits.

This study aims at assessing the impacts of conservation tillage (CT) on household income and wheat consumption among Syrian farmers. Analysis is based on 621 wheat producing farmers in Syria. The propensity score-matching method and the endogenous switching regression model are employed in this study to analyze the impacts of CT where the necessary check for covariate balancing with a standardized bias was conducted. Results from both the propensity score matching and switching regression suggest that after controlling for all confounding factors, adoption of the ZT technology leads to about US\$192/ha higher crop income. Moreover, the average gain in wheat consumption by the matched adopters over the matched non-adopters is about 26kg per adult equivalent per year (34%).

Table: Average treatment effects on the treated (ATT) for net income and consumption using the propensity score matching (PSM) approach

| Group | Treatment group | Control group | Average treatment effect on the treated (ATT) | S.E. | T-stat |
|-------------|-----------------|---------------|---|--------|---------|
| Net income | | | | | |
| Unmatched | 38024.4 | 27299.3 | 10725.1 | 966.5 | 11.1*** |
| ATT | 37131.8 | 27534.2 | 9597.5 | 1722.6 | 5.57*** |
| Consumption | | | | | |
| Unmatched | 79.6 | 48.6 | 31.0 | 2.8 | 11.3*** |
| ATT | 76.9 | 50.5 | 26.4 | 7.6 | 3.5*** |

Source: model results

Note: *** indicates significance at 1% level

These results confirm that apart from the benefits documented in many studies in terms of enhancing sustainable management of land, ZT is also associated with increased livelihoods of farm households. Therefore, CT is one of few technologies which can be justified on environmental, economic and food security grounds and hence can have sizeable impacts in transforming the agricultural sector in the developing world. The policy implication of these results is that governments should consider embracing CT as one of the priority technology packages in their national extension programs.

In view of the tremendous skepticism about the profitability of CA, especially in the context of the mixed crop-livestock production systems, this paper is expected to make substantial contribution to the literature. By providing the much needed empirical evidences on the benefits of ZT for improving livelihoods of farmers, the results of this study are expected to be useful to policy makers, extension offices, government and non-governmental development organizations, development agents and researchers working in Syria and other areas with similar agro-climatic and production systems.

Key words: Food security; household income; CT technology; propensity score; matching endogenous switching

References:

- Belloum, A , 2007. Conservation Agriculture in the Arab World between Concept and Application. In Stewart, B.I, A. F. Asfary, A. Belloum, K. Steiner, T. Friedrich (eds.), Conservation Agriculture for Sustainable Land Management to Improve the Livelihood of People in Dry Areas.<http://www.fao.org/ag/ca/doc/CA%20Workshop%20proceeding%2008-08-08.pdf>.
- Ribera, L., F. Hons, and J. Richardson, 2004. An Economic Comparison Between Conventional and No-Tillage Farming Systems in Burleson County, Texas. *Agronomy Journal*. 96: 415-424.
- International Center for Agricultural Research in the Dry Areas (ICARDA) ,2012. Conservation agriculture: opportunities for intensified farming and environmental conservation in dry areas. ICARDA Research to Action 2. <http://www.icarda.org/sites/default/files/conv-agree.pdf>