

## Design and Agronomic Assessment of an Implement for Conservation Agriculture Bed Planting in Tunisia.

Mohamed Jadlaoui<sup>1\*</sup>, Anis Boussalmi<sup>1</sup>, Rabeh Kalboussi<sup>1</sup>, Ghazoua Haouari<sup>2</sup> 1: National Institute of field crops, BP 120 Bousalem 8170, Tunisia

2: Higher School of Agricultural Engineers of Medjez El-Bab, Tunisia

\*Corresponding author: Tel +21698741137 E-mail address: [mohamed.jadlaoui@gmail.com](mailto:mohamed.jadlaoui@gmail.com)

Worldwide water is becoming a scarce resource particularly in semiarid areas. Prediction scenarios show it will be increasingly so in the coming. This will limit crop production and jeopardize human livelihood. Moreover, volatile energy prices will impose significant changes in farmer practices because of the economic implications on farming net returns. Traditional irrigated cropping systems in Tunisia use intensive soil tillage and flood (flat) irrigation techniques, which generally lead to a water table depletion, soil compaction, poor water use efficiency and low crop productivity. Previous studies in other countries (Mexico, Bangladesh...), indicate significant advantages with conservation agriculture (CA) and raised bed techniques. These were not assessed before in Tunisia. A three year work conducted during 2010-2013 period at Chbika experimental Station in central Tunisia (35°37'13.71''N, 9°56'16.23''E) showed a potential for net benefits from a combination of CA and irrigation using raised beds techniques. During the first year grain yield of two durum varieties were collected from fresh raised 60 cm width beds and flat irrigated 200 m<sup>2</sup> plots with two replications. During the second year, the same varieties were sown on fresh bed, permanent bed and flat irrigated plots that harbored a faba bean crop during the previous year. In the third year both varieties were sown on same first year (permanent bed, fresh and flat) plots that were sown to faba bean during the second year.

Seeding was done during the first week of december during the three years. Seeding rates were 180 kg/ha and 150 Kg/ha respectively for Maali and Khiar on raised beds and 220 Kg/ ha and 180 Kg/ha for the same varieties on flat irrigated plots.



Fig: an implement was built to create beds and an old conventional seeder was used with low disturbance points, modified wheel placement and row spacing to fit the beds

Preliminary results show that sowing on raised beds resulted in a 0.2 to 0.3 t/ha yield increase in both varieties and during the three cropping seasons compared to flat irrigation. However, differences were not significant. Moreover sowing on raised beds used 20% less seeds compared to flat irrigated plots. This will add to economic benefit of sowing on raised beds. This technique helped also reduce time for soil preparation by 4.75 to 5.75 h/ha, which represent around 20% of total production cost. Irrigation with raised beds used 20 to 30 % less water than flat irrigation adding to the above-mentioned benefits. An implement was built to create beds. Wheel placement and row spacing were modified on an old conventional seeder with low disturbance points for seeding in the first year. In subsequent year, a new direct seeder with bed shaping parts was manufactured locally and used to seed CA plots. Nearby farmers were impressed with the initial results during field

days and some are keen to test this technology.

**Keywords:** raised bed, irrigation, zero tillage seeder, reduced tillage

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